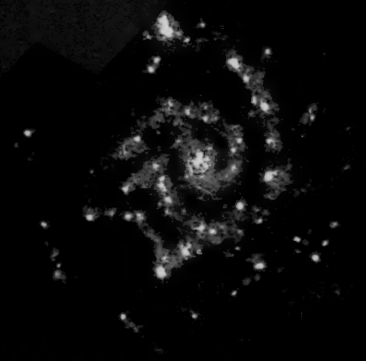
Scientific and Technical Aerospace Reports



An Abstract Journal

Volume 31, Number 12
December 1993
N93-31040 to N93-32425

The NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program plays a key part in helping NASA maintain this important role.

The NASA STI Program provides access to the NASA STI Database, the largest collection of aeronautical and space science STI in the world. The Program is also NASA's institutional mechanism for disseminating the results of its research and development activities.

Specialized services that help round out the Program's diverse offerings include creating custom thesauri, translating material to or from 34 foreign languages, building customized databases, organizing and publishing research results ... even providing videos.

For more information about the NASA STI Program, you can:

- **Phone** the NASA Access Help Desk at (301) 621-0390
- **Fax** your question to the NASA Access Help Desk at (301) 621-0134
- **E-mail** your question via the **Internet** to help@sti.nasa.gov
- **Write** to:

  NASA Access Help Desk
  NASA Center for AeroSpace Information
  800 Elkridge Landing Road
  Linthicum Heights, MD 21090-2934

Scientific and Technical Aerospace Reports

Scientific and Technical Aerospace Reports (STAR), is published each month as a major product of the International Aerospace Database, managed by the NASA Scientific and Technical Information (STI) Program.

Inside this issue you will find:

Front Matter
A typical citation and abstract sample explaining the standard format, which includes codes for ordering reports.

An Abstract Section
Citations and abstracts of reports and publications that provide comprehensive coverage of worldwide aerospace-related topics including aeronautics and space science technology. *STAR* lists published and publicly available reports entered into the NASA STI Database during the four weeks preceding publication of this issue. These citations and abstracts are listed by subject categories.

An Index Section
- Subject
- Personal author
- Corporate source
- Contract number
- Report number.

Appendix
A guide for ordering cited reports, registering with the NASA STI Program, and using the available products and services. Additionally, price schedules, phone numbers, and addresses are included in this information packed section.

NASA also sponsors companion journals, *International Aerospace Abstracts (IAA)*, and *NASA Open Volumes on Aerospace (NOVA)*. They list abstracts of the open literature on aerospace subjects available worldwide. IAA is available from the American Institute of Aeronautics and Astronautics (AIAA), and *NOVA* is for internal NASA use only, available from the NASA Center for AeroSpace Information (CASI).

Reports found in *STAR* are also available through the NASA online retrieval service, RECON, and the Aerospace Database through DIALOG.

The NASA STI Program gathers information through national and international agreements and exchanges and makes this information available to the NASA community and to the public in many forms through various outlets.

For additional information on the NASA STI Program, call the NASA Access Help Desk at (301) 621-0390, or write to:

NASA Center for AeroSpace Information
800 Elkridge Landing Road
Linthicum Heights, Maryland 21090-2934

US ISSN 0036-8741

This publication was prepared by the NASA Center for AeroSpace Information,
800 Elkridge Landing Road, Linthicum Heights, MD 21090-2934, (301) 621-0390.

Volume 31 Number 12 / December 1993

TABLE OF CONTENTS

AERONAUTICS For related information see also *Astronautics.*

01 AERONAUTICS (GENERAL) **3671**

02 AERODYNAMICS **3671**
Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery. For related information see also 34 *Fluid Mechanics and Heat Transfer.*

03 AIR TRANSPORTATION AND SAFETY **3674**
Includes passenger and cargo air transport operations; and aircraft accidents. For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION **3675**
Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also *17 Space Communications, Spacecraft Communications, Command and Tracking* and *32 Communications and Radar.*

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE **3678**
Includes aircraft simulation technology. For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.* For land transportation vehicles see *85 Urban Technology and Transportation.*

06 AIRCRAFT INSTRUMENTATION **3680**
Includes cockpit and cabin display devices; and flight instruments. For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

07 AIRCRAFT PROPULSION AND POWER **3681**
Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion.*

08 AIRCRAFT STABILITY AND CONTROL **3683**
Includes aircraft handling qualities; piloting; flight controls; and autopilots. For related information see also *05 Aircraft Design, Testing and Performance.*

09 RESEARCH AND SUPPORT FACILITIES (AIR) **3684**
Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands. For related information see also *14 Ground Support Systems and Facilities (Space).*

ASTRONAUTICS For related information see also *Aeronautics.*

12 ASTRONAUTICS (GENERAL) **3685**
For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

13 ASTRODYNAMICS **3685**
Includes powered and free-flight trajectories; and orbital and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) **3686**
Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators. For related information see also *09 Research and Support Facilities (Air).*

15 LAUNCH VEHICLES AND SPACE VEHICLES **3686**
Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles. For related information see also *20 Spacecraft Propulsion and Power.*

16 SPACE TRANSPORTATION **3687**
Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information see also *03 Air Transportation and Safety* and *18 Spacecraft Design, Testing and Performance.* For space suits see *54 Man/System Technology and Life Support.*

17 SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING....N.A.
Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout. For related information see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar.*

N.A.—No abstracts were assigned to this category for this issue.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE **3687**
Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls. For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance, 39 Structural Mechanics,* and *16 Space Transportation.*

19 SPACECRAFT INSTRUMENTATION **3691**
For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

20 SPACECRAFT PROPULSION AND POWER **3691**
Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 44 Energy Production and Conversion,* and *15 Launch Vehicles and Space Vehicles.*

CHEMISTRY AND MATERIALS

23 CHEMISTRY AND MATERIALS (GENERAL) **3699**

24 COMPOSITE MATERIALS **3699**
Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see *27 Nonmetallic Materials.*

25 INORGANIC AND PHYSICAL CHEMISTRY **3702**
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also *77 Thermodynamics and Statistical Physics.*

26 METALLIC MATERIALS **3704**
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS **3707**
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials.*

28 PROPELLANTS AND FUELS **3712**
Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

29 MATERIALS PROCESSING **3714**
Includes space-based development of products and processes for commercial application. For biological materials see *55 Space Biology:*

ENGINEERING For related information see also *Physics.*

31 ENGINEERING (GENERAL) **3714**
Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

32 COMMUNICATIONS AND RADAR **3715**
Includes radar; land and global communications; communications theory; and optical communications. For related information see also *04 Aircraft Communications and Navigation* and *17 Space Communications, Spacecraft Communications, Command and Tracking.* For search and rescue see *03 Air Transportation and Safety,* and *16 Space Transportation.*

33 ELECTRONICS AND ELECTRICAL ENGINEERING **3719**
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry. For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

34 FLUID MECHANICS AND HEAT TRANSFER **3722**
Includes boundary layers; hydrodynamics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 INSTRUMENTATION AND PHOTOGRAPHY **3728**
Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing.* For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation.*

36 LASERS AND MASERS **3731**
Includes parametric amplifiers. For related information see also *76 Solid-State Physics.*

37 MECHANICAL ENGINEERING 3733
Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 3738
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 3739
Includes structural element design and weight analysis; fatigue; and thermal stress. For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

GEOSCIENCES For related information see also *Space Sciences.*

42 GEOSCIENCES (GENERAL) ..... N.A.

43 EARTH RESOURCES AND REMOTE SENSING 3743
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see *35 Instrumentation and Photography.*

44 ENERGY PRODUCTION AND CONVERSION 3748
Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower. For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *28 Propellants and Fuels.*

45 ENVIRONMENT POLLUTION 3750
Includes atmospheric, noise, thermal, and water pollution.

46 GEOPHYSICS 3756
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For space radiation see *93 Space Radiation.*

47 METEOROLOGY AND CLIMATOLOGY 3766
Includes weather forecasting and modification.

48 OCEANOGRAPHY 3769
Includes biological, dynamic, and physical oceanography; and marine resources. For related information see also *43 Earth Resources and Remote Sensing.*

LIFE SCIENCES

51 LIFE SCIENCES (GENERAL) 3771

52 AEROSPACE MEDICINE 3772
Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

53 BEHAVIORAL SCIENCES 3775
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 3777
Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also *16 Space Transportation.*

55 SPACE BIOLOGY ..... N.A.
Includes exobiology; planetary biology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) 3784

60 COMPUTER OPERATIONS AND HARDWARE 3784
Includes hardware for computer graphics, firmware, and data processing. For components see *33 Electronics and Electrical Engineering.*

61 COMPUTER PROGRAMMING AND SOFTWARE 3785
Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.

62 COMPUTER SYSTEMS 3794
Includes computer networks and special application computer systems.

63 CYBERNETICS **3797**
Includes feedback and control theory, artificial intelligence, robotics and expert systems. For related information see also *54 Man/System Technology and Life Support.*

64 NUMERICAL ANALYSIS **3801**
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY **3810**
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS **3812**
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS **3812**
Includes topology and number theory.

PHYSICS For related information see also *Engineering.*

70 PHYSICS (GENERAL) **3814**
For precision time and time interval (PTTI) see *35 Instrumentation and Photography*; for geophysics, astrophysics or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics.*

71 ACOUSTICS **3815**
Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS **3817**
Includes atomic structure, electron properties, and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS **3822**
Includes elementary and nuclear particles; and reactor theory. For space radiation see *93 Space Radiation.*

74 OPTICS **3823**
Includes light phenomena and optical devices. For lasers see *36 Lasers and Masers.*

75 PLASMA PHYSICS **3825**
Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS **3827**
Includes superconductivity. For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS **3830**
Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics. For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

80 SOCIAL SCIENCES (GENERAL) **3833**
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT **3834**
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE **3835**
Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS ..... **N.A.**
Includes cost effectiveness studies.

84 LAW, POLITICAL SCIENCE AND SPACE POLICY ..... **N.A.**
Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION **3843**
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation. For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) ..... **N.A.**

89 ASTRONOMY **3844**
Includes radio, gamma-ray, and infrared astronomy; and astrometry.

90 ASTROPHYSICS **3851**
Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust. For related information see also *75 Plasma Physics.*

91 LUNAR AND PLANETARY EXPLORATION **3861**
Includes planetology; and manned and unmanned flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance.*

92 SOLAR PHYSICS **3867**
Includes solar activity, solar flares, solar radiation and sunspots. For related information see also *93 Space Radiation.*

93 SPACE RADIATION **3882**
Includes cosmic radiation; and inner and outer earth's radiation belts. For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs.

99 GENERAL **3883**

SUBJECT INDEX **I-1**

PERSONAL AUTHOR INDEX **I-87**

CORPORATE SOURCE INDEX **I-99**

CONTRACT NUMBER INDEX **I-115**

REPORT NUMBER INDEX **I-117**

APPENDIX **A-1**

TYPICAL CITATION AND ABSTRACT

NASA SPONSORED
ON MICROFICHE

ACCESSION NUMBER → **N93-10068*#** Washington Univ., Seattle. Dept. of Atmospheric Sciences. ← CORPORATE SOURCE

TITLE → **AIR-SEA INTERACTION AND REMOTE SENSING Status Report, 1 Dec. 1991 - 30 Nov. 1992**

AUTHORS → Kristina B. Katsaros and Serhad S. Ataktuerk 1992 ← PUBLICATION DATE

12 p Original contains color illustrations

CONTRACT OR GRANT → (Grant NAGw-1322)

REPORT NUMBERS → (NASA-CR-190913; NAS 1.26:190913) Avail: CASI HC A03/MF A01; 2 functional color pages ← AVAILABILITY SOURCE AND PRICE CODE

The first part of the proposed research was a joint effort between our group and the Applied Physics Laboratory (APL), University of Washington. Our own research goal is to investigate the relation between the air-sea exchange processes and the sea state over the open ocean and to compare these findings with our previous results obtained over a small body of water namely, Lake Washington. The goals of the APL researchers are to study (1) the infrared sea surface temperature (SST) signature of breaking waves and surface slicks, and (2) microwave and acoustic scattering from water surface. The task of our group in this joint effort is to conduct measurements of surface fluxes (of momentum, sensible heat, and water vapor) and atmospheric radiation (longwave and shortwave) to achieve our research goal as well as to provide crucial complementary data for the APL studies. The progress of the project is summarized. Author

VOLUME 31 NUMBER 12 / December 1993

Scientific and Technical Aerospace Reports

A Monthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N93-32232# Wichita State Univ., KS. National Inst. for Aviation Research.
INTERNATION AIRCRAFT OPERATOR INFORMATION SYSTEM Final Report
John J. Hutchinson, John M. Ellis, Yan Yang, Jim North, and Lisa Ong Apr. 1993 132 p
(DOT/FAA/CT-93/4) Avail: CASI HC A07/MF A02

The purpose of this program is to deliver to the Federal Aviation Administration (FAA) an automated information system which will provide useful aircraft information on all United States type certificated aircraft worldwide. The product is a system which is periodically updated and accessible to all FAA offices. The system makes use of commercially available data and other data from the public domain. From these data over 70 different tables were created and maintained. In order to identify aircraft, a unique coding system was created which extends the Aviation Safety Analysis System (ASAS) to all the world's aircraft. A similar coding system was created to identify and validate the names of the owners and operators of aircraft. In order for the FAA to use this information, a series of menu driven forms was created. FAA personnel can log into the system via modem to obtain and download a variety of reports. A user knowledgeable in Oracle can also prepare and download specialized reports without compromising the security of the system. Author

N93-32375* National Aeronautics and Space Administration, Washington, DC.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 292)
Jun. 1993 187 p
(NASA-SP-7037(292); NAS 1.21:7037(292)) Avail: CASI HC A09

This bibliography lists 675 reports, articles, and other documents recently introduced into the NASA scientific and technical information system database. Subject coverage includes the following: design, construction and testing of aircraft and aircraft engines; aircraft components, equipment, and systems; ground support systems; and theoretical and applied aspects of aerodynamics and general fluid dynamics. Author (revised)

N93-32404* National Aeronautics and Space Administration, Washington, DC.
EUROPEAN AEROSPACE SCIENCE AND TECHNOLOGY, 1992: A BIBLIOGRAPHY WITH INDEXES
Jun. 1993 485 p
(NASA-SP-7105; NAS 1.21:7105) Avail: CASI HC A21

This bibliography contains 1916 annotated references to reports and journal articles of European intellectual origin entered into the NASA Scientific and Technical Information System during 1992. Representative subject areas include: spacecraft and aircraft design, propulsion technology, chemistry and materials, engineering and mechanics, earth and life sciences, communications, computers and mathematics, and the natural space sciences. Author (revised)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N93-31052# Aeronautical Research Inst. of Sweden, Stockholm.
GARTEUR 3D SHEER LAYER EXPERIMENT Main Model Report
Ernst Totland Oct. 1992 72 p
(FFA-TN-1992-26; GARTEUR-AD(AG07)TP069; ETN-93-94214) Avail: CASI HC A04/MF A01

The structural design and manufacture of the two main half wing models for the GARTEUR shear layer experiment are described. The models are identical in shape, but different in size. Both models have the same structural design based on a foam and fiberglass sandwich shell with a minimum of internal structure. The geometrical properties of the models are thoroughly documented. The instrumentation of the two models is also documented. This consists of a large number of pressure taps, hot film sensors for skin friction measurements and internally traversable boundary layer probes. The two models contribute to the project GARTEUR AG 07, which concerns the experimental investigation of turbulent shear layers on a swept wing. ESA

N93-31148# National Aerospace Lab., Amsterdam (Netherlands). Aerodynamics Div.
COMPUTATIONAL METHODS FOR AERODYNAMIC DESIGN OF AIRCRAFT COMPONENTS
T. E. Labrujere and J. W. Slooff 25 Feb. 1992 51 p Submitted for publication
(NLR-TP-92072-4; ETN-93-94081) Avail: CASI HC A04/MF A01

The state of the art in the field of computational aerodynamic design methods is summarized. The review is limited to methods aiming directly at the determination of geometries such that certain specified aerodynamic properties will be obtained, with or without constraints in the geometry. Moreover, only methods considered as being representative for different types of approach and methods illustrating the latest developments are presented. Methods for airfoil and wing design are emphasized. The problem of target pressure distribution specification is discussed. ESA

N93-31171# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Goettingen (Germany). Gruppe Instationaere Aerodynamik.
TDLM: A TRANSONIC DOUBLET LATTICE METHOD FOR 3D POTENTIAL UNSTEADY TRANSONIC FLOW CALCULATION
Shuquan Lu (Nanjing Aeronautical Inst., China.) and Ralph Voss Sep. 1992 44 p
(DLR-FB-92-25; ETN-93-93956) Avail: CASI HC A03/MF A01; DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

The develoompent of a Transonic Doublet Lattice Method (TDLM) for calculating unsteady transonic pressure distributions and airloads is reported. The flow around harmonically oscillating surfaces is described by superposition of a steady transonic ocean flow and an unsteady harmonic flow. The unsteady flow component is modeled by acceleration potential doublets in the mean wing surface and a source distribution in the flow field near the wing. The time linearized unsteady transonic small perturbation equation is solved by an integral equation method. Results for a rectangular wing, the Northrop F-5 wing, and the LANN wing in pitching oscillation are presented. Comparisons are made with both experimental and other

numerical results. Agreement with the experimental results is very good. The computing time in the IBM 3090 is less than ten minutes for one reduced frequency, and it shows that the TDLM can provide a sufficiently accurate and cost effective procedure for routine transonic flutter calculations. ESA

N93-31189# National Aerospace Lab., Tokyo (Japan).
LOW-SPEED WIND TUNNEL STUDY OF THE DIRECT SIDE-FORCE CHARACTERISTICS OF A JOINED-WING AIRPLANE WITH AN UPPER FIN
T. Fujita, A. Iwasaki, H. Fujieda, and N. Takizawa Mar. 1992 23 p
(DE93-767966; NAL-TM-645) Avail: CASI HC A03/MF A01 (US Sales Only)

Low-speed wind tunnel tests were conducted on a diamond shaped joined-wing airplane with its horizontal tail width linked at a 60%-position of the wing width, fitted with an upper fin having a trailing fin to control side force. Effects of the upper fin were discussed on direct side-force control characteristics. The diamond shaped joined-wing airplane model used in the tests had a wing width of 1.3m and a total fuselage length of 1.6m. The upper fins used in the tests were those having different wing shapes and those having identical wing shapes with different aspect ratios. Their fitting positions were varied along the chord direction. The low-speed wind tunnel tests were carried out with the airplane model fitted on three balance stanchions in the wind tunnel, at a test wind velocity of 30 m/s. Derived for discussions were aerodynamic effect when the fins on the rudders on the wing and the vertical tail were operated independently, and aerodynamic characteristics for direct side-force control when the upper fin fitting position was varied, and the side-force coefficients. It was found that upper fins installed at the front wing leading edge or over-hanging upper fins are effective in controlling the direct side force, and a large aspect ratio is advantageous in gaining the side force. DOE

N93-31320# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Abt. Flugmechanik der Drehfluegelflugzeuge.
THE INFLUENCE OF VARIABLE FLOW VELOCITY ON UNSTEADY AIRFOIL BEHAVIOR M.S. Thesis - Maryland Univ., College Park
Berend vanderWall Feb. 1992 148 p
(DLR-FB-92-22; UM-AERO-91-46; ETN-93-93739) Avail: CASI HC A07/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

Unsteady aerodynamics of oscillating airfoils in constant freestream velocity are widely used for prediction of rotor dynamics. The additional degrees of freedom, namely the fore-aft motion and the unsteady freestream variation are neglected in virtually all analyses. Since the effect of unsteady freestream results in a stretching and compressing of the shed wake vorticity distribution behind an airfoil, it will have an effect on the airfoil characteristics. A review of the analytic and experimental work done in the area of unsteady freestream and to clarify the limits of the various theories is presented. As far as possible, the theories are compared with experimental data; however, most of the available data are confined to stalled flow conditions and are not useful. In addition to the theories, a semi-empirical mathematical model is used for purposes of comparison based on the aerodynamics of indicial functions. A generalization and closed form solution of the unsteady aerodynamic theory for incompressible two dimensional flow including fore-aft blade motion is derived and presented. With this it can be shown that the available theories are either not at all or only in parts able to correctly predict these effects. ESA

N93-31538# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
PARAMETRIC STUDIES OF SHOCK WAVE/BOUNDARY LAYER INTERACTIONS OVER 2D COMPRESSION CORNERS AT MACH 6
J. P. Vermeulen and G. Simeonides Sep. 1992 141 p
(VKI-TN-181; ETN-93-94223) Avail: CASI HC A07/MF A02

Results fron a series of experiments performed in the VKI H-3 hypersonic wind tunnel at Mach 6 with flat plate and flat plate/two dimensional (2D) compression ramp configurations simulating deflected control surfaces (rudders, elevons, flaps) of hypersonic vehicles are presented. The study falls within the framework of a more general investigation on shock wave/boundary layer interactions. The main experimental measurement technique was infrared thermography. The technique and data reduction models were improved in order to achieve state of the art accuracy levels. The model configurations considered have involved sharp and moderately blunt leading edges, as well as additional (periodic) leading edge disturbances. The thermal effect and the behavior of streamwise striations, detected in reattaching flow regions and interpreted as the footprint of Goertler vortices developing due to the concave flow curvature in such regions are discussed. Extensive comparisons of heat transfer data in regions of shock wave/boundary layer interaction, from the present work and other investigators, with simple theoretical predictions are presented. These led to the development of a new peak heating correlation, based on the reference temperature method, which was found to apply to two and three dimensional fully laminar, transitional and fully turbulent interactions, and to provide accurate engineering estimates of peak heating even in the presence of severe heat transfer non-uniformities (striations). ESA

N93-31648*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
STREAMWISE VORTICITY GENERATION AND MIXING ENHANCEMENT IN FREE JETS BY DELTA-TABS
K. B. M. Q. Zaman Jun. 1993 15 p Presented at the AIAA Shear Flow Conference, Orlando, FL, 6-9 Jul. 1993; sponsored by AIAA
(RTOP 505-62-52)
(NASA-TM-106235; E-7955; NAS 1.15:106235; AIAA Paper 93-3253)
Avail: CASI HC A03/MF A01

The effect of triangular tabs, placed at the nozzle exit, on the evolution of free jets is investigated. The effect, a large distortion of the jet cross section and a resultant increase in mixing downstream, has been inferred before to be due to a pair of streamwise vortices originating from each tab. In this paper, the generation mechanism of the stream wise vorticity (omega sub x) is considered first. Two sources are postulated. One is the upstream 'pressure hill', produced by the tab, which appears to be the dominant source. Another is due to vortex filaments shed from the sides of the tab and reoriented downstream by the mean shear of the mixing layer. In the case of a 'delta-tab', a triangular tab with its apex leaning downstream, vorticity from the two sources explain the stronger effect in that configuration. Data on the vorticity evolution for the effect of two delta-tabs are presented, up to twelve jet diameters from the exit, which show that the streamwise vortices persist even at the farthest measurement station. The magnitude of omega sub x-maximum decays continually with distance from the nozzle, its ratio to azimuthal vorticity maximum is found to be about 1/5 everywhere. The relative effect of a delta-tab on jets from an axisymmetric nozzle and a 8:1 rectangular nozzle is also studied. The mixing layer distortion is found to be less pronounced in the rectangular case. The jet mixing, as manifested by the mass flux measured at a downstream station, is increased in the axisymmetric jet but it is decreased in the rectangular jet under consideration by the delta-tab.
Author (revised)

N93-31672*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ENHANCED MIXING OF A RECTANGULAR SUPERSONIC JET BY NATURAL AND INDUCED SCREECH
Edward J. Rice and Ganesh Raman (Sverdrup Technology, Inc., Brook Park, OH.) Jul. 1993 14 p Presented at the AIAA Shear Flow Conference, Orlando, FL, 6-9 Jul. 1993; sponsored by AIAA
(RTOP 505-62-52)
(NASA-TM-106245; E-7964; NAS 1.15:106245; AIAA Paper 93-3263)
Avail: CASI HC A03/MF A01

The influence of shear layer excitation on the mixing of supersonic rectangular jets was studied experimentally. Two methods of excitation were used to control the jet mixing. The first used the natural screech of an underexpanded supersonic jet from a converging nozzle. The level of the screech excitation was controlled by the use of a pair of baffles located to block the acoustic feedback path between the downstream shock structure and the nozzle lip. A screech level variation of over 30 decibels was achieved and the mixing was completely determined by the level of screech attained at the nozzle lip. The second form of self-excitation used the induced screech caused by obstacles or paddles located in the shear layers on either long side of the rectangular jet. With sufficient immersion of the paddles intense jet mixing occurred and large flapping wave motion was observed using a strobed focused Schlieren system. Each paddle was instrumented with a total pressure tap and strain gages

to determine the pressure and drag force on the square cross-section paddle. Considerable drag was observed in this initial exploratory study. Future studies using alternate paddle geometries will be conducted to maximize jet mixing with minimum drag. Author

N93-31732*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

REYNOLDS NUMBER INFLUENCES IN AERONAUTICS

Dennis M. Bushnell, Long P. Yip, Chung-Sheng Yao, John C. Lin, Pierce L. Lawing, John T. Batina, Jay C. Hardin, Thomas J. Horvath, James W. Fenbert, and Christopher S. Domack May 1993 172 p

(RTOP 505-60-01-02)

(NASA-TM-107730; NAS 1.15:107730) Avail: CASI HC A08/MF A02

Reynolds number, a measure of the ratio of inertia to viscous forces, is a fundamental similarity parameter for fluid flows and therefore, would be expected to have a major influence in aerodynamics and aeronautics. Reynolds number influences are generally large, but monatomic, for attached laminar (continuum) flow; however, laminar flows are easily separated, inducing even stronger, non-monatomic, Reynolds number sensitivities. Probably the strongest Reynolds number influences occur in connection with transitional flow behavior. Transition can take place over a tremendous Reynolds number range, from the order of 20 x 10(exp 3) for 2-D free shear layers up to the order of 100 x 10(exp 6) for hypersonic boundary layers. This variability in transition behavior is especially important for complex configurations where various vehicle and flow field elements can undergo transition at various Reynolds numbers, causing often surprising changes in aerodynamics characteristics over wide ranges in Reynolds number. This is further compounded by the vast parameterization associated with transition, in that any parameter which influences mean viscous flow development (e.g., pressure gradient, flow curvature, wall temperature, Mach number, sweep, roughness, flow chemistry, shock interactions, etc.), and incident disturbance fields (acoustics, vorticity, particulates, temperature spottiness, even electro static discharges) can alter transition locations to first order. The usual method of dealing with the transition problem is to trip the flow in the generally lower Reynolds number wind tunnel to simulate the flight turbulent behavior. However, this is not wholly satisfactory as it results in incorrectly scaled viscous region thicknesses and cannot be utilized at all for applications such as turbine blades and helicopter rotors, nacelles, leading edge and nose regions, and High Altitude Long Endurance and hypersonic airbreathers where the transitional flow is an innately critical portion of the problem. Author (revised)

N93-31733*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

SUPERSONIC AERODYNAMIC CHARACTERISTICS OF AN ADVANCED F-16 DERIVATIVE AIRCRAFT CONFIGURATION

Mike C. Fox (Vigyan Research Associates, Inc., Hampton, VA.) and Dana K. Forrest Washington Jul. 1993 122 p Microfiche as supplement

(Contract NAS1-18585; RTOP 505-59-30-01)

(NASA-TP-3355; L-17143; NAS 1.60:3355) Avail: CASI HC A06/MF A02

A supersonic wind tunnel investigation was conducted in the NASA Langley Unitary Plan Wind Tunnel on an advanced derivative configuration of the United States Air Force F-16 fighter. Longitudinal and lateral directional force and moment data were obtained at Mach numbers of 1.60 to 2.16 to evaluate basic performance parameters and control effectiveness. The aerodynamic characteristics for the F-16 derivative model were compared with the data obtained for the F-16C model and also with a previously tested generic wing model that features an identical plan form shape and similar twist distribution. Author (revised)

N93-31839*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

TURBULENCE MEASUREMENT IN A REACTING AND NON-REACTING SHEAR LAYER AT A HIGH SUBSONIC MACH NUMBER

C. T. Chang, C. J. Marek, C. Wey (Sverdrup Technology, Inc., Brook Park, OH.), R. A. Jones (Rensselaer Polytechnic Inst., Troy, NY.), and M. J. Smith (Purdue Univ., West Lafayette, IN.) Jun. 1993 8 p Prepared for presentation at the Ninth Symposium on Turbulent Shear Flows, Kyoto, Japan, 16-18 Aug. 1993

(RTOP 505-62-52)

(NASA-TM-106186; E-7891; NAS 1.15:106186) Avail: CASI HC A02/MF A01

The results of two component velocity and turbulence measurements are presented which were obtained on a planar reacting shear layer burning hydrogen. Quantitative LDV and temperature measurements are presented with and without chemical reaction within the shear layer at a velocity ratio of 0.34 and a high speed Mach number of 0.7. The comparison showed that the reacting shear layer grew faster than that without reaction. Using a reduced width coordinate, the reacting and non-reacting profiles were very similar. The peak turbulence for both cases was 20 percent. Author

N93-31855*# California Polytechnic State Univ., San Luis Obispo. Dept. of Aeronautical Engineering.

EFFECTS OF AN AFT FACING STEP ON THE SURFACE OF A LAMINAR FLOW GLIDER WING Final Report, 1 Jan. 1991 - 30 Jun. 1993

Doral R. Sandlin and Neal Saiki Jun. 1993 141 p

(Contract NCC2-701)

(NASA-CR-193302; NAS 1.26:193302) Avail: CASI HC A07/MF A02

A motor glider was used to perform a flight test study on the effects of aft facing steps in a laminar boundary layer. This study focuses on two dimensional aft facing steps oriented spanwise to the flow. The size and location of the aft facing steps were varied in order to determine the critical size that will force premature transition. Transition over a step was found to be primarily a function of Reynolds number based on step height. Both of the step height Reynolds numbers for premature and full transition were determined. A hot film anemometry system was used to detect transition. Author

N93-32004# Universal Energy Systems, Inc., Dayton, OH.

CALCULATIONS ON UNSTEADY TYPE 4 INTERACTION AT MACH 8 Final Report, Dec. 1981 - Aug. 1992

Datta Gaitonde Jan. 1993 40 p

(Contract F33615-90-C-2089)

(AD-A265214; WL-TR-93-3002) Avail: CASI HC A03/MF A01

The viscous unsteady flow due to a type 4 shock-on-shock interaction at Mach 8 is examined with an implicit flux-split scheme. A sequence of grids is utilized to perform a grid resolution study and the results are compared with experimental values. The formulation is finite-volume with higher order accuracy obtained with the MUSCL approach in conjunction with a limiter to prevent oscillations. Viscous terms are centrally differenced. The flow exhibits a limit cycle in aggregate quantities which can be related to the details for the flow structure. The supersonic jet bounded by the two shear layers displays large scale movement at a dominant frequency of 32 kHz. This is accompanied by variation in the angle between the terminating jet bow shock and the surface tangent. Unsteady separation regions are observed both above and below the point of jet impingement. DTIC

N93-32226*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

SELECTED EXPERIMENTS IN LAMINAR FLOW: AN ANNOTATED BIBLIOGRAPHY

Aaron Drake and Robert A. Kennelly, Jr. Dec. 1992 30 p

(RTOP 505-59-10)

(NASA-TM-103989; A-93012; NAS 1.15:103989) Avail: CASI HC A03/MF A01

Since the 1930s, there have been attempts to reduce drag on airplanes by delaying laminar to turbulent boundary layer transition. Experiments conducted during the 1940's, while successful in delaying transition, were discouraging because of the careful surface preparation necessary to meet roughness and waviness requirements. The resulting lull in research lasted nearly 30 years. By the late 1970s, airframe construction techniques had advanced sufficiently that the high surface quality required for natural laminar flow (NLF) and laminar flow control (LFC) appeared possible on production aircraft. As a result, NLF and LFC research became widespread. This report is an overview of that research. The experiments summarized herein were selected for their applicability to small transonic aircraft. Both flight and wind tunnel tests are included. The description of each experiment is followed by corresponding references. Part One summarizes NLF experiments; Part Two deals with LFC and hybrid laminar flow control (HLFC) experiments. Author

N93-32357# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.
PANEL METHODS FOR AERODYNAMIC ANALYSIS AND DESIGN
H. W. M. Hoeijmakers 15 Oct. 1991 54 p Presented at AGARD-FDP/VKI Special Course on Engineering Methods in Aerodynamic Analysis and Design of Aircraft, Ankara, Turkey, 6-10 May 1991; Brussels, Belgium, 13-17 May 1991; and Madrid, Spain, 20-24 May 1991 Sponsored in part by Netherlands Agency for Aerospace Programs, Delft, and Royal Netherlands Air Force
(NLR-TP-91404-U; ETN-93-94074; AD-B168792L) Avail: CASI HC A04/MF A01

Several aspects of panel methods in the aerodynamic analysis and design of aircraft or aircraft components are discussed. Panel methods can provide the flow about complex configurations and are used in the analysis of the aerodynmics of aircraft shapes. Panel methods are based on a mathematical model in which much of the fluid physics is ignored. The capabilities and limitations of panel methods, the basic concepts of panel methods, choices that can be made in the implementation of the basic concepts, as well as possible types of boundary conditions that can be applied to model subsonic and supersonic flow are discussed. Some aspects of the accuracy of the approximations involved, consistent formulations, aspects of low order and higher order panel methods are investigated. Computational aspects of panel methods and possible extensions to nonlinear compressible flows, coupling with viscous flow methods and application to other flow problems are discussed. ESA

N93-32358# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.
NLR INVISCID TRANSONIC UNSTEADY LOADS PREDICTION METHODS IN AEROELASTICITY
M. H. L. Hounjet 15 Dec. 1991 22 p Presented at the AGARD Specialists Meeting on Transonic Unsteady Aerodynamics and Aeroelasticity, San Diego, CA, 9-11 Oct. 1991 Sponsored in part by Royal Netherlands Air Force
(Contract NIVR-01904N)
(NLR-TP-91410-U; ETN-93-94075; AD-B169113L) Avail: CASI HC A03/MF A01

Unsteady inviscid calculation methods developed at the National Aerospace Laboratory (NLR), which are based on the full potential equation for the prediction of airloads in oscillating structures in transonic flow, are presented. Attention is given to experience with entropy/vorticity corrections and to a procedure which removes the frequency barrier associated with time linearized modelings. This procedure has a favorable effect in computer cost such that transonic flutter boundaries can be obtained in accceptable turn around times on current work stations. A method for the transonic aeroelastic analysis of complete aircraft is introduced. Attention is given to its grid generation procedure. The methods are demonstrated by showing results of unsteady loads and pressure coefficients applications in two and three dimensional transonic flow and of an aeroelastic application to a three dimensional AGARD standard aeroelastic case in transonic flow. ESA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N93-31652# Transportation Research Center of Ohio, East Liberty.
LONGITUDINAL ACCELERATION TEST OF OVERHEAD LUGGAGE BINS IN A TRANSPORT AIRFRAME SECTION Report, Jun. 1990 - Jan. 1991
Darrell Ault Nov. 1992 311 p
(Contract DTFA03-88-C-00066)
(DOT/FAA/CT-92/9) Avail: CASI HC A14/MF A03

A 10-foot transport airframe section was longitudinally tested at the Transportation Research Center (TRC) Inc. The purpose of the test was to measure the structural responses of and the interaction between the overhead storage bins and fuselage under simulated, potentially survivable, impact conditions. Three tests were conducted using the TRC 24-inch Hyge Shock Tester. The first test attained a peak acceleration of 5.9 g and a velocity change of 30.7 ft/sec. The second test reached 8.8 g and 37.5 ft/sec. The third test resulted in 13.2 g and 42.3 ft/sec. The input acceleration pulses were triangular in shape. The airframe test section was configured with two triple passenger seats in two rows on the left side, four anthropomorphic test dummies (ATD), a 60-inch overhead storage bin (Bin A) on the right side, and a 20- by 20-inch set of overhead storage bins (Bin B) on the left side. Author (revised)

N93-31730 Civil Aviation Authority, London (England).
REPORTABLE ACCIDENTS TO UK REGISTERED AIRCRAFT, AND TO FOREIGN REGISTERED AIRCRAFT IN UK AIRSPACE, 1990
Mar. 1992 149 p
(CAP-600; ISBN-0-86-039500-6; ETN-93-93932) Copyright Avail: Issuing Activity (Civil Aviation Authority, Greville House, 37 Gratton Road, Cheltenham, England, HC)

A survey providing details of accidents involving UK (United Kingdom) and foreign registered aircraft which occurred during the calendar year 1990 and which were reportable in accordance with the Provisions of the Civil Aviation (Investigation of Accidents) Regulations, 1983, is presented. Descriptive data for each accident and analyses of these accidents are given. Data for accidents to power driven lighter than air aircraft and data for accidents to foreign registered aircraft in UK airspace are provided. The causal factors allocated are listed. Operating statistical and accident rates are given. ESA

N93-32195 National Transportation Safety Board, Washington, DC.
AIRCRAFT ACCIDENT REPORT: TAKEOFF STALL IN ICING CONDITIONS. USAIR FLIGHT 405, FOKKER F-28, N485US, LAGUARDIA AIRPORT, FLUSHING, NEW YORK, 22 MARCH 1992
17 Feb. 1993 130 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB93-910402; NTSB/AAR-93/02) Avail: CASI HC A07

The report explains the crash of USAir flight 405, a Fokker 28-4000, after an attempted takeoff from runway 13 at LaGuardia Airport, Flushing, New York, on March 22, 1992. The safety issues in the report focus on the weather. USAir's deicing procedures, industry airframe deicing practices, air traffic control aspects of the flight, USAir's takeoff and preflight procedures, and flightcrew qualifications and training. The airplane's impact with the ground, postaccident survivability, and crash/fire/rescue activities are also discussed. Safety recommendations concerning these issues are addressed to the Federal Aviation Administration, the Port Authority of New York and New Jersey, the Department of Transportation, and the New York City Health and Hospitals Corporation. Author

N93-32196 National Transportation Safety Board, Washington, DC.
AIRCRAFT ACCIDENT REPORT: CONTROLLED COLLISION WITH TERRAIN GP EXPRESS AIRLINES, INC., FLIGHT 861, A BEECHCRAFT C99, N118GP, ANNISTON, ALABAMA, 8 JUNE 1992
2 Mar. 1993 79 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB93-910403; NTSB/AAR-93/03) Avail: Issuing Activity (National Technical Information Service (NTIS))

The report explains the controlled collision into terrain of GP Express flight 861, a Beechcraft C99, N118GP, in Anniston, Alabama, on June 8, 1992. The safety issues discussed in the report are, for aircraft operating under 14 CFR Part 135, the importance of adequate preparation and experience of newly hired captains, available approach charts for each pilot, and adherence to specific stabilized approach criteria. The importance of adequate cockpit resource management is also discussed. Recommendations concerning these issues were made to the Federal Aviation Administration. Author

N93-32409 Civil Aviation Authority, London (England).
UK AIRMISSES INVOLVING COMMERCIAL AIR TRANSPORT, SEPTEMBER - DECEMBER 1991
Jul. 1992 33 p
(ETN-93-93930) Copyright Avail: Issuing Activity (Civil Aviation Authority, Greville House, 37 Gratton Road, Cheltenham, England)

Statistics and reports concerning commercial air transport airmisses in the United Kingdom (UK) are presented. Copies of the airmiss reports include summaries of the information reported and of the working group's discussions, and an assessment of risk and cause. ESA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Space Communications, Spacecraft Communications, Command and Tracking* and *Communications and Radar.*

N93-31120# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.

EXPERIENCES WITH TWO GPS RECEIVERS IN NORTHERN EUROPE

O. B. M. Pietersen 22 Apr. 1991 34 p

(NLR-TP-91168-U; ETN-93-94059) Avail: CASI HC A03/MF A01

The results of measurements with two handheld GPS (Global Positioning System) C/A-code SPS (Standard Positioning Service) receivers at thirty locations in Finland, Norway and Sweden, are presented. The computed positions obtained from receivers and positions in geographic maps are compared. The results showed that both receivers are not satisfactorily operated. A combination of the characteristics of the two would give a nearly ideal receiver. The measured accuracies are within the specifications given by the U.S. for SPS receivers. However to arrive at these results extra coordinate transformations, not available to an ordinary user, were necessary in the case of Finland and Sweden. ESA

N93-31271# European Space Agency, Paris (France).

FLIGHT TEST OF AVIONIC AND AIR-TRAFFIC CONTROL SYSTEMS

Helmut Bothe (Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick, Germany.) Jan. 1993 277 p Transl. into ENGLISH of Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 1-262 Presented at DLR Institute for Flight Guidance and Control Scientific Conference, Brunswick, Germany, 4-5 Jun. 1991 Original language document was announced as N92-25590 (ESA-TT-1279; DLR-Mitt-91-11; ETN-93-93917) Avail: CASI HC A13/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

Papers concerning the flight testing of avionics and air traffic control systems are presented. Either the tools and methods employed are discussed, or the systems in the process of development and their testing are discussed. For individual titles, see N93-31272 through N93-31284.

N93-31272# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Flugabteilung.

THE DLR TEST AIRCRAFT IN THE FZ-BS, -VFW 614/ATTAS, DORNIER DO 228-101, MBB BO105 S-3 **c25**

Hans-L. Meyer *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 6-30 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 9-34 Original language document was announced as N92-25591 (For primary document see N93-31271 12-04)

Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

The particular equipment, capabilities, and flight characteristics of certain research aircraft are addressed: the DO 228, an all metal high wing aircraft with two turboprops; the BO-105 flying helicopter simulator; and the VFW 614/ATTAS (Advance Technologies Testing Aircraft Systems) flying simulator. These are used in tests at Brunswick (Germany) where research programs center on flight mechanics, flight guidance, and aerodynamics. The high performance systems used for inflight measurements, trials, and tests are addressed. These include various simulators, telemetry,and data processing systems, and measurement equipment for each aicraft. These test facilities are used to pursue research objectives from the conceptual stage to that of flight testing as the final link in the chain. Flight tests are currently performed for the following programs: navigation and air traffic control, transport aircraft technologies, helicopter technologies, and simulation and design principles. ESA

N93-31273# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.

THE BASIC MEASUREMENT EQUIPMENT OF THE DLR TEST AIRCRAFT **c06**

Helmut Bothe *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 31-44 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 35-48 Original language document was announced as N92-25592 (For primary document see N93-31271 12-04)

Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

The basic measurement equipment of a test aircraft is described. The primary functions of the instruments are as follows: to obtain, via a comprehensive sensor system, all the parameters which are required for the widest range of investigations and operating modes; to process, filter, and adapt signals; and to retransmit them to the terminals of existing flight data processing systems. An integrated Pulse Code Modulation (PCM) system digitizes analog sensor signals and constructs a serial PCM data stream in which data from aircraft data processing systems can also be incorporated as required. During flight tests, this PCM signal is stored onboard in magnetic tapes and can be transmitted in parallel to the ground via a RF telemetry link. This basic equipment is supplemented by components which also enable transmission of data from ground to air. ESA

N93-31274# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.

GROUND INSTALLATIONS FOR PREPARATION AND EVALUATION OF FLIGHT TESTS **c09**

G.-J. Barth *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 45-53 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 49-56 Original language document was announced as N92-25593 (For primary document see N93-31271 12-04)

Avail: CASI HC A02/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

Ground test installations for the flight guidance and control offered by telemetry equipment are discussed. The equipment available for telemetry can be employed centrally for all flight testing, but it does not cover the whole range. Consequently, there are other important installations for special tests and test platforms, which, for example, enable safety critical flight tests. The conditions applicable to telemetry are focused upon. These inlude output of measurement values by conventional analog means. Furthermore, calibrated data can be displayed on screen as numerical values or bar charts. Chronological curves can also be displayed on screen and hardcopy plotter. The three groups of equipment currently available for telemetry, which differ considerably as to their display and analysis facilities, are discussed. One group uses Pulse Code Modulator (PCM) decoders which operate without further support of any kind, another uses decommutators with support (one advantage of this is that it enables data storage), and the other uses a PC decommutator. Telemetry ground installations also include an installation which transmits data in the ground-to-air direction. The PCM encoder which is necessary to do this is discussed. ESA

N93-31275# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.

INSTIGATION AND PROCESSING OF FLIGHT TESTS IN DLR **c05**

Helmut Bothe *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 54-68 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 57-70 Original language document was announced as N92-25594 (For primary document see N93-31271 12-04)

Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

The planning procedures taken when external users wish to use the DLR flight test installations, which mainly include test aircraft and helicopters together with their test equipment, are outlined. The calculation of the cost of use and the modifications necessary to the equipment are addressed. The most important of the airborne equipment items include the following:

an airborne system for reference flight path, avionics sensor systems, measurement data acquisition and transmission systems, a system for flight measurement of aeronautical radio systems,and an experimental cockpit. The most important ground systems include the following: tracking radar, laser radar, recording theodolite system, telemetry receiver system with online data processing, gyro test system, air traffic simulatior, ground test vehicle, and RF irradiation system. ESA

N93-31276# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.

ATTAS EXPERIMENTAL-COCKPIT AND ATMOS FOR COMPONENT AND SYSTEM INVESTIGATIONS IN FLIGHT GUIDANCE **c09**

Ralf Beyer *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 69-82 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 71-84 Original language document was announced as N92-25595 (For primary document see N93-31271 12-04)

Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

The installations created in the ATTAS (Advanced Technologies Testing Aircraft Systems) experimental cockpit and the ATMOS (Air Traffic Management and Operations Simulator) for implementation of experimental investigations into corresponding airborne and ground based components and systems, and in particular the air to ground interaction, are described. The ATTAS experimental cockpit is the airborne test environment for component and system investigations into future air traffic guidance. The ATMOS air traffic control simulator is the ground based test environment for components and system investigations into the air traffic control of the future. The systems being added to ATMOS for future research projects include the following: COMPAS (Computer Oriented Metering, Planning and Advisory System), a simulator of taxiing traffic, and a visual system for the display of sumulated taxing aircraft. Future prospects are considered. ESA

N93-31277# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.

TESTING OF AN EXPERIMENTAL FMS **c05**

Volkmar Adam *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 83-103 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 85-104 Original language document was announced as N92-25596 (For primary document see N93-31271 12-04)

Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

The development of an experimental Flight Management System (FMS) with new functions is described, and the initial flight testing of this FMS in conjunction with air traffic simulations is illustrated. Functions of the FMS include the following: planning of flight trajectories, precise guidance of the aircraft, negotiation of trajectories and tubes with a ground based air traffic control planning computer, transmission of meteorological data measured onboard the aircraft to a ground based dynamic meteorological database, and sampling of sector related meteorological data from this meteorological data base for purpose of airborne flight planning. The testing of the FMS is performed by an experimental system consisting of the following: an airborne system represented by the ATTAS (Advanced Technologies Testing Aircraft Systems) test aircraft; a ground system based on ATMOS (Air Traffic Management and Operations Simulator); and a data link for communication between the airborne and ground systems. The different phases of the experimental program are outlined with attention being focused on the validation of planning and guidance functions and the air/ground negotiation of trajectories. ESA

N93-31278# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.

TESTING CONCEPT OF A TAXIING CONTROL SYSTEM, SUMMARY **c08**

A. Becker *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 104-114 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 105-113 Original language document was announced as N92-25597 (For primary document see N93-31271 12-04)

Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

The requirements and testing necessary for the design of a ground traffic control system are addressed. Work is focused on the following: construction of a planning, monitoring, and guidance system for ground traffic on the airfield; construction of a system for detection of any obstacles and of the state vector of the targets (traffic units) on the airfield; and construction of a communication system for air to ground and ground to air data links. The requirements for target state vector determination are as follows: location accuracy 5 m; velocity accuracy 0.5 m/s; heading accuracy 5 deg; minimum measurement rate 1/sec; and individual identification. Requirements for digital communication are as follows: data exchange between airborne and ground systems; transmission of guidance information to the pilot; uplink capacity 400 bit/s per traffic unit; and downlink capacity 300 bit/s per traffic unit. The following candidate elements are considered as supplementary elements for location: the differential multialteration method (hyperbola navigation; based on SSR mode S or DME (Distance Measuring Equipment) basic systems); the differential GPS (Global Positioning System); and a composite system of coherent pulsed dislocated radar elements with fixed antenna (noncooperative system). ESA

N93-31279# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.

PALLET FOR HELICOPTER TEST INSTRUMENTATION **c06**

Georg Haehnlein and Peter Jaensch *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 115-156 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 114-153 Original language document was announced as N92-25598 (For primary document see N93-31271 12-04)

Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

The system concept, its implementation, and some typical applications of an airworthy helicopter experimental system are described. The BO-105 is used as the test platform. This flight test platform is distinguished from the standard production machine by two substantial modifications: a modified, large capacity experimental cockpit, and a four axis fly by wire/fly by light control system. The items of equipment present in a general survey are presented and are discussed with regard to their functions or selection criteria. The equipment items in the BO-105 are as follows: flight controls (electronic signal pick off from the jogstick or side stick in all four control axes); fly by wire/light control (electro hydraulic actuators in all four control axes); sensors (Doppler ASI, strapdown attitude reference system, radio altimeter, air data computer); navigation (global positioning system, VOR (Very high frequency Omnidirectional Range), distance measuring equipment, instrument landing equipment receiver); data processing (aircraft computer, measurement data conditioning); data save (logging, quick look) (up/down PCM (Pulse Code Modulation) telemetry, data logging in the air and on the ground); and instruments (test cockpit) (electronic 5 inch color displays, multifunctional controls). Ground simulation, used for direct flight test preparation, is discussed. The five years of successful use of the helicopter experimental system is stressed. ESA

N93-31280# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.

DEVELOPMENT AND FLIGHT TESTING OF A FAULT-TOLERANT FLY-BY-LIGHT YAW CONTROL SYSTEM **c08**

G. Mansfeld, K. Bender, and J. Tersteegen *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 157-183 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 154-176 Original language document was announced as N92-25599 (For primary document see N93-31271 12-04)

Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

An overview of a fly by light yaw control system which uses the DISCUS (Digital Self healing Control for Upgraded Safety) computing system, its

implementation, and the results of flight testing are provided. The objectives of the program described were to utilize innovative technologies in signal transmissions, actuator systems, and redundancy management and to test a single axis feed forward controller with 100 percent actuation accuracy. Plans to expand DISCUS to build a 4 axis control system are outlined. Details of the DISCUS system concept, computer architecture, and data processing concept are given. The integrated fiber optic intelligent actuator has command input via fiber optical cables. The main goals in the design and evaluation of the yaw controller were to improve the helicopter's handling characteristics and to expand its range of operation. These goals and the flight testing of the yaw controller are addressed. ESA

N93-31281# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.

GROUND- AND SATELLITE-DERIVED FLIGHT-PATH MEASUREMENTS AS DEMONSTRATED IN THE AFES AVIONICS FLIGHT EVALUATION SYSTEM (AFES)

Bernhard Stieler and Karlheinz Hurrass *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 184-218 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 177-206 Original language document was announced as N92-25600 (For primary document see N93-31271 12-04)

Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

A description of the AFES is given, and its future expansion is considered. A microwave radar and an inertial system are currently the basic AFES sensors; in the airfield vicinity, up to a radius of approximately 10 km, they are supplemented by a laser tracker. All measurement signals are obtained in an online system on board the aircraft, using optimum estimation algorithms for highly accurate calculation of the reference path. The system has proven its merit in the testing of the following systems: inertial navigation and attitude reference systems, very high frequency omnidirectional range/Distance Measuring Equipment (DME); various integrated navigation systems; precision DME; geographic positioning system receiver; microwave landing system; three way DME (developed for flight guidance and control); and the 'image reconnaissance' experimental system. The following points are the subject of tests, particularly for navigation systems: coverage and accuracy, influence of faults, operation suitability, and system demonstrations. The means by which the reference path is determined is outlined. The accuracy of the AFES reference system is discussed. ESA

N93-31282# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.

ON-BOARD DERIVED FLIGHT-PATH MEASUREMENT AS DEMONSTRATED BY AN ILS MEASUREMENT SYSTEM

Bernhard Stieler and Karlheinz Hurrass *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 219-248 Transl. into ENGLISH from Flugerprobung von Avionik von Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 207-232 Original language document was announced as N92-25601 (For primary document see N93-31271 12-04)

Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

The structure, problems, and advantages of a fully airborne, as opposed to satellite-derived, flight path measurement system are described in the light of an Instrument Landing System (ILS). In the case of this airborne measurement technology, the inertial system is far more important than in the case of ground supported and satellite supported measurement technology, where it has been used predominantly for interpolation between external measurement data. Further conventional sensors for independent aircraft flight path measurement technology are the barometric and radar altimeters. Charge coupled device cameras provide the means of introducing new technologies into the field of airborne aircraft flight path measurement. At the present state of the art, a system with support by optical measurements will require correlation of the recorded image with stored image position information. This topic is the basis of quite a recent branch of research which is entitled 'image supported navigation'. Work is also in hand to define the principles for applying an Inertial Navigation System (INS) to flight path measurements totally independent of prestored information. These principles are discussed. A measurement system for testing radio navigation systems is defined, its system concept is described, results obtained using it to date are given, and scope for its improvement are described. Airborne and satellite based flight path measurement and independent aircraft measurement are compared with particular regard to image processing, that is, the processing of terrain features for INS support, in a critical juxtaposition. The arguments set out are equally applicable for navigation. ESA

N93-31283# Deutsche System-Technik G.m.b.H., Bremen (Germany).

TESTING OF AN EXPERIMENTAL SYSTEM FOR IMAGE RECONNAISSANCE **c74**

H. Keil and P. Schulz (Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick, Germany.) *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 249-263 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 233-246 Original language document was announced as N92-25602 (For primary document see N93-31271 12-04)

Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

Operations performed in the context of an experimental study entitled 'experimental system for image data reduction, storage, and interference resistant transmission for Remotely Piloted Vehicle (RPV) application' (image reconnaissance) are described. The goal was to produce a complete functional system for interference resistant air image transmission from the IR camera on the aircraft to ground station up to 100 km away where it could be viewed on a monitor, in order to be able to investigate the complex, interactive influences and dependencies of individual image processing and data saving processes, and to check out individual results in aircraft testing in a realistic scenario. The special features of the system are its installations for image illustration and storage, for analysis on the ground, the control of the system and image sensor from the ground station and the interference resistant duplex radio transmission between the flying test platform and the ground station. In order to optimize the applied methods, there is also the facility of varying a multitude of system parameters even during operation. This is particularly important with regard to optimum adaptation of the transmission mode to interference arising at a given time. The operations performed so far consisted of proposing, constructing, and flight testing the experimental system. A further operation will involve the planning of a modern process for reduction of image data, in order to make it possible to perform comparative testing with the existing process, in flight operations. There is investigation of hybrid solutions for both processes. ESA

N93-31284# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.

INSTALLATIONS AND METHODS FOR MEASUREMENT OF AIRCRAFT RADIO COMPONENTS AND SYSTEMS **c32**

Juergen Tetzlaff *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 264-276 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 247-259 Original language document was announced as N92-25603 (For primary document see N93-31271 12-04)

Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

The requirements and workings of a flight measurement system for measurement of radio frequency systems and components used in flight control and guidance are described. These systems and components consist of radio systems for communication, navigation, flight monitoring (Air Traffic Control (ATC)), and radar systems for flight monitoring (ATC); recognition and protection procedures. A range of subsystems and components for such installations requires in flight testing. In the case of radio systems, this relates primarily to aircaft antenna whose radiation patterns have to be measured in flight. In the case of radar systems for flight monitoring, it is particularly important to have knowledge of the radar cross section of whatever aircraft are involved, in order to estimate system range and probability of detection. Recognition systems (electronic support measurement) require measurement of antenna radiation diagrams and direction, finding antenna accuracy. In order to ascertain the coverage of

systems operating electronic countermeasures, it is also necessary to have knowledge of the radiation patterns of the antennae involved. Although the above mentioned system characteristics can also be at least approximately determined by other methods (theoretical calculations, model measurements, and static measurements on the original on ground test rigs), flight measurements, for example for design acceptance of new aircraft types, is neccessary. These provide practical values and make it possible largely to avoid interferences and omissions which could affect the results of the other processes mentioned above. ESA

N93-32225*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

FLIGHT EVALUATION OF A COMPUTER AIDED LOW-ALTITUDE HELICOPTER FLIGHT GUIDANCE SYSTEM

Harry N. Swenson, Raymond D. Jones (Army Avionics Lab., Fort Monmouth, NJ.), and Raymond Clark (Army Avionics Lab., Fort Monmouth, NJ.) Jan. 1993 14 p Presented at the AGARD FMP/GCP Symposium on Combat Automation for Airborne Weapons Systems: Man/Machine Interface Trends and Technologies, Scotland, England, 19-22 Oct. 1992

(RTOP 505-64-36)

(NASA-TM-103998; A-93033; NAS 1.15:103998) Avail: CASI HC A03/MF A01

The Flight Systems Development branch of the U.S. Army's Avionics Research and Development Activity (AVRADA) and NASA Ames Research Center developed for flight testing a Computer Aided Low-Altitude Helicopter Flight (CALAHF) guidance system. The system includes a trajectory-generation algorithm which uses dynamic programming and a helmet-mounted display (HMD) presentation of a pathway-in-the-sky, a phantom aircraft, and flight-path vector/predictor guidance symbology. The trajectory-generation algorithm uses knowledge of the global mission requirements, a digital terrain map, aircraft performance capabilities, and precision navigation information to determine a trajectory between mission waypoints that seeks valleys to minimize threat exposure. This system was developed and evaluated through extensive use of piloted simulation and has demonstrated a 'pilot centered' concept of automated and integrated navigation and terrain mission planning flight guidance. This system has shown a significant improvement in pilot situational awareness, and mission effectiveness as well as a decrease in training and proficiency time required for a near terrain, nighttime, adverse weather system. Author (revised)

N93-32336# Federal Aviation Administration, Atlantic City, NJ. Technical Center.

INVESTIGATION OF ADVANCED TECHNOLOGY FOR AIRWAY FACILITIES MAINTENANCE TRAINING Technical Note, Aug. 1991 - Jun. 1992

Lori Adkisson, Julie Jones (Galaxy Scientific Corp., Atlanta, GA.), and Joseph Jackson (Galaxy Scientific Corp., Atlanta, GA.) Jun. 1993 32 p

(Contract DTFA03-90-C-00010)

(DOT/FAA/CT-TN92/24) Avail: CASI HC A03/MF A01

The phase one activities of a three-phase research plan are described. The first activity investigated the status of advanced technology in currently available Airway Facilities (AF) computer-based maintenance training. The second activity applied simulation, Expert System, and Intelligent Tutoring Technology in developing a prototype system for trouble shooting proficiency training. Author (revised)

N93-32337# National Aerospace Lab., Amsterdam (Netherlands). Aircraft Instrumentation Dept.

THE APPLICATION OF PHASE TRACKING GPS FOR FLIGHT TEST TRAJECTORY DETERMINATION

R. vandeLeijgraaf and Storm vanLeeuwen 18 Oct. 1991 20 p Presented at the 1st International Symposium on Real Time Differential Applications of the Global Positioning System, Brunswick, Germany, 16-20 Sep. 1991

(NLR-TP-91349-U; ETN-93-94070; AD-B168788L) Avail: CASI HC A03/MF A01

Geodesists have been using the Navstar Global Positioning System (GPS) for a number of years for high accuracy position measurements. For the last two or three years, GPS receivers with carrier phase tracking capability have been used onboard aircraft for photommetry and gravitational research. The phase tracking technique appears to be suitable for a flight test positioning system. The behavior of GPS receivers in the dynamic environment of a test aircraft is discussed. The set up and execution of the tests are described. The test program that was carried out in the Summer of 1991 consisted of a limited dynamics test on the ground and a full dynamics test in flight. Since the analysis of the data is not finished, only preliminary results are presented. ESA

N93-32348*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

EXPANSION-BASED PASSIVE RANGING

Yair Barniv Jun. 1993 59 p

(RTOP 505-64-36)

(NASA-TM-104025; A-93087; NAS 1.15:104025) Avail: CASI HC A04/MF A01

A new technique of passive ranging which is based on utilizing the image-plane expansion experienced by every object as its distance from the sensor decreases is described. This technique belongs in the feature/object-based family. The motion and shape of a small window, assumed to be fully contained inside the boundaries of some object, is approximated by an affine transformation. The parameters of the transformation matrix are derived by initially comparing successive images, and progressively increasing the image time separation so as to achieve much larger triangulation baseline than currently possible. Depth is directly derived from the expansion part of the transformation. To a first approximation, image-plane expansion is independent of image-plane location with respect to the focus of expansion (FOE) and of platform maneuvers. Thus, an expansion-based method has the potential of providing a reliable range in the difficult image area around the FOE. In areas far from the FOE the shift parameters of the affine transformation can provide more accurate depth information than the expansion alone, and can thus be used similarly to the way they were used in conjunction with the Inertial Navigation Unit (INU) and Kalman filtering. However, the performance of a shift-based algorithm, when the shifts are derived from the affine transformation, would be much improved compared to current algorithms because the shifts - as well as the other parameters - can be obtained between widely separated images. Thus, the main advantage of this new approach is that, allowing the tracked window to expand and rotate, in addition to moving laterally, enables one to correlate images over a very long time span which, in turn, translates into a large spatial baseline - resulting in a proportionately higher depth accuracy. Author (revised)

N93-31269# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).

THE USE OF DIGITAL ROAD DATA BY A NAVIGATION SYSTEM [NUTZUNG DIGITALER STRASSENDATEN FUER KFZ-NAVIGATIONSSYSTEME]

Joachim Siebold *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 113-120 In GERMAN (For primary document see N93-31256 12-43)

Avail: CASI HC A02/MF A02

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.For land transportation vehicles see *85 Urban Technology and Transportation*.

N93-31043# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (Germany). Hubschrauber und Flugzeuge.

ADVANCED AIRCRAFT WITH THRUST VECTOR CONTROL [HOCHLEISTUNGSFLUGZEUGE MIT SCHUBVEKTORSTEUERUNG]

Hannes Ross 6 Feb. 1992 110 p In GERMAN Presented at Techniche Univ. Munich, Germany, 6 Feb. 1992

(MBB-FE-1-S-PUB-0504; ETN-93-94192) Copyright Avail: CASI HC A06/MF A02

Overhead projections are presented. Thrust vectoring and deflection principles are examined with the examples of American and Russian military aircraft such as the F-14, X-31, and YAK-38. Curves on pitch and yaw deflection distribution are presented. Thrust vectoring systems were depicted in aircraft and ground tests. Vane temperature of vibration results were

obtained. Curves of thrust moment versus aerodynamic moment were studied, and it is concluded that the thrust generated moment must be used at low Mach/dynamic pressure. Axisymmetric thrust vectoring potential utilization and trim requirements were examined. New aircraft concepts were proposed, with emphasis on elimination or reduction of tails. It is pointed out that thrust vectoring augmentation improves aircraft performances and weapon system modifications are necessary to exploit aircraft performance increases. ESA

N93-31046# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (Germany). Hubschrauber und Flugzeuge.

DEVELOPMENT OF NOSE STRUCTURE OF A RECONNAISSANCE CONTAINER FOR A SUPERSONIC JET AIRCRAFT Thesis - Fachhochschule Munich [ENTWICKLUNG DER BUGSTRUKTUR EINES AUFKLAERUNGS-AUSSENLASTBEHAELTERS FUER EIN UEBERSCHALL-STRAHLFLUGZEUG]

Micheal Rauter 31 Jul. 1992 263 p In GERMAN Original contains color illustrations

(MBB-LME-242-S-PUB-0451; ETN-93-94197) Copyright Avail: CASI HC A12/MF A03

A predesign study of the nose structure of a reconnaissance container is presented for implementation in a liquid film camera. The possible configurations of the nose structure were presented. The configurations were differentiated by camera system accessibility. The surveillance camera system and the optimization of camera window size were depicted. Static and dynamic loads were examined for strength determination by means of the finite element program NASTRAN, so that mainframe and sheathing can be predimensioned. Color tension graphics allow dimensioning load factors to be obtained. ESA

N93-31058# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (Germany). Produktbereich Militaerflugzeuge.

AIRCRAFT STRUCTURES IN 2000: A TECHNOLOGICAL CHALLENGE? [FLUGZEUGSTRUKTUREN IM JAHR 2000: EINE TECHNOLOGISCHE HERAUSFORDERUNG?]

Josef Walter Vilsmeier 7 Jul. 1992 12 p In GERMAN Presented at DGLR-Jahrestagung 1992, Bremen, Germany, 29 Sep. - 2 Oct. 1992

(MBB-LME-202-S-PUB-0485; ETN-93-94194) Copyright Avail: CASI HC A03/MF A01

Technology requirements for the next aircraft generation are reviewed. It is noticed that a foresighted planning of research programs is needed, such as short and cost optimized development times, by using concurrent or simultaneous engineering. Structure optimization must be achieved by taking into account weight reduction and boundary conditions. The importance of light metals, such as fiber reinforced aluminum alloys, and of fiber reinforced composites, is highlighted. It is shown that smart materials must be developed, and their effect on aircraft structures must be analyzed. Measurement and testing methods and facilities must be developed by considering design to cost requirements. ESA

N93-31197# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Abt. Zellenaerodynamik.

DEFINITION OF AN AIRFOIL FAMILY FOR THE EUROFAR ROTOR [ENTWICKLUNG EINER PROFILFAMILIE FUER DEN EUROFAR-ROTOR]

Matthias Schmidt Dec. 1991 104 p In GERMAN

(DLR-FB-92-04; ETN-93-93953) Avail: CASI HC A06/MF A02; DLR, Wissenschaftliches Berichtsewesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

The development of an airfoil family for the rotor of the European Tilt Rotor Project EUROFAR (European Future Advanced Rotorcraft) is reported. The design is based on requirements which included desired operation conditions and airfoil characteristics. Airfoils were designed for the inner radial stations of the rotor blade. Suitable existing airfoils are available for the outer stations. All the airfoils will be or were measured in a transonic wind tunnel. The root airfoils, having large relative thickness, were measured in low speed wind tunnels to examine high lift characteristics. In many cases the experimental results are in a good agreement with the calculated data, thus proving high quality of the calculation procedure and manufacturing technology for aerofoil models. The airfoil family presented meets nearly all requirements. ESA

N93-31840# National Aerospace Lab., Amsterdam (Netherlands). Aerodynamics Div.

REVIEW OF AERODYNAMIC DESIGN IN THE NETHERLANDS

T. E. Labrujere 12 Jul. 1991 35 p Presented at the 3rd International Conference on Inverse Design Concepts and Optimization in Engineering Sciences, Washington, DC, 23-25 Oct. 1991

(NLR-TP-91260-U; ETN-93-94065; AD-B169208L) Avail: CASI HC A03/MF A01

A survey of aerodynamic design activities in the Netherlands is given. The survey concentrates on the development of the Fokker 100 wing, glider design, and research in the field of aerodynamic design. Results to illustrate these activities are shown. Research work to extend the design system for wings in subsonic flow for application to wings of wing-body combinations in viscous transonic flow is in progress. The extension of this system for applications in multi-point wing design are being considered. ESA

N93-32203# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.

AGEING AIRCRAFT RESEARCH IN THE NETHERLANDS

J. B. deJonge and G. Bartelds 14 Nov. 1991 17 p Presented at the 1992 International Conference on Ageing Aircraft and Structural Airworthiness, Washington, DC, 19-20 Nov. 1991

(NLR-TP-91443-U; ETN-93-94076; AD-B169203L) Avail: CASI HC A03/MF A01

An overview of the research currently carried out on aircraft aging in the Netherlands is given. The work described is largely done at the National Aerospace Laboratory NLR. The major part is performed under contracts as part of cooperation agreements. The research programs are directed towards the prevention of aging aircraft problems in future aircraft and concentrated in two areas: prevention of multi-site damage in lap joints; improving knowledge on operational load experience. ESA

N93-32205# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.

DAMAGE SEVERITY OF MONITORED FATIGUE LOAD SPECTRA

J. B. deJonge 15 Jan. 1992 10 p Presented at the 8th ICAS Congress, Beijing, China, Sep. 1992

(NLR-TP-92009-U; ETN-93-94078; AD-B168787L) Avail: CASI HC A02/MF A01

Many military aircraft are used more severely and over a longer period than originally intended. Consequently, a careful life management, including service load monitoring is required. The development of a method to quantify the severity in terms of 'potential crack growth' of recorded load spectra is described. This crack severity index accounts for load interaction effects under spectrum loading. Crack growth tests under different load spectra proved the validity of the crack severity index concept. It is shown that the crack severity index concept can also be used as a tool in studies to influence fatigue life consumption by operation measures. ESA

N93-32338# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.

DEVELOPMENT OF A METHOD TO PREDICT TRANSONIC LIMIT CYCLE OSCILLATION CHARACTERISTICS OF FIGHTER AIRCRAFT

J. J. Meijer and A. M. Cunningham, Jr. (General Dynamics/Fort Worth, TX.) 18 Oct. 1991 26 p Presented at the AGARD Specialists Meeting on Transonic Unsteady Aerodynamics and Aeroelasticity, San Diego, CA, 9-11 Oct. 1991 Sponsored by USAF; General Dynamics; and National Aerospace Lab., Netherlands

(Contract NIVR-07801N)

(NLR-TP-91359-U; ETN-93-94071; AD-B169597L) Avail: CASI HC A03/MF A01

The analysis of steady wind tunnel data, obtained for a fighter type aircraft, indicated that shock induced and trailing edge separation plays a dominant role in the development of Limit Cycle Oscillations (LCO) at transonic speeds. On this basis, a semi-empirical LCO prediction method, which makes use of such steady wind tunnel data, was developed. The method has the potential for application in the design process of new aircraft to determine and understand the nonlinear aeroelastic characteristics. The method is still being evaluated, and upgrading and refinements are expected from unsteady wind tunnel force and pressure measurements to

be obtained from oscillating models. The method and results of the latest predictions are presented. The results are compared with flight test trends and used to assess various parametric effects. ESA

N93-32416# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
EVALUATION OF THE FLYABILITY OF MLS CURVED APPROACHES FOR WIDE-BODY AIRCRAFT
Louis J. J. Erkelens and Jan-Hein vanDronkelaar 15 Dec. 1992 14 p Presented at the AIAA Guidance, Navigation and Control Conference, New Orleans, LA, 12-14 Aug. 1991 Sponsored by FAA
(NLR-TP-91396-U; ETN-93-94073; AD-B169205L) Copyright Avail: CASI HC A03/MF A01

The evaluation of the flight director aided curved Microwave Landing System (MLS) approach paths with a simulated wide body transport aircraft is presented. Four curved approach paths were evaluated. An MLS equivalent of the 13R Canarsie visual approach was investigated. Test objects were: to demonstrate the flyability of curved approaches for wide body type of aircraft; to collect scientific data in pilot performance and operational acceptance for manually flown curved approaches; and to determine the operationally acceptable minimum straight final segment length. The test included various wind and visual conditions. Winds yielding limiting conditions and winds providing airframe limiting conditions were included. 320 curved approaches were flown for data collection. The experimental results consisted of both objective and subjective data. Objective data concerned statistical data of path deviations, aircraft state and control variables. Subjective data were derived from questionnaire responses and pilot comments. ESA

N93-31275# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.
INSTIGATION AND PROCESSING OF FLIGHT TESTS IN DLR
Helmut Bothe *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 54-68 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 57-70 Original language document was announced as N92-25594 (For primary document see N93-31271 12-04)
Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

N93-31277# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.
TESTING OF AN EXPERIMENTAL FMS
Volkmar Adam *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 83-103 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 85-104 Original language document was announced as N92-25596 (For primary document see N93-31271 12-04)
Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N93-32218*# Computer Sciences Corp., Hampton, VA.
ADVANCED TRANSPORT OPERATING SYSTEM (ATOPS) UTILITY LIBRARY SOFTWARE DESCRIPTION Final Report, Jun. 1988 - Nov. 1991
Winston C. Clinedinst, Christopher J. Slominski, Richard W. Dickson, and David A. Wolverton Apr. 1993 55 p
(Contract NAS1-19038; RTOP 505-64-13)
(NASA-CR-191469; NAS 1.26:191469) Avail: CASI HC A04/MF A01

The individual software processes used in the flight computers on-board the Advanced Transport Operating System (ATOPS) aircraft have many common functional elements. A library of commonly used software modules was created for general uses among the processes. The library includes modules for mathematical computations, data formatting, system database interfacing, and condition handling. The modules available in the library and their associated calling requirements are described. Author (revised)

N93-32223*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
AIRBORNE DERIVATION OF MICROBURST ALERTS FROM GROUND-BASED TERMINAL DOPPLER WEATHER RADAR INFORMATION: A FLIGHT EVALUATION
David A. Hinton Aug. 1993 31 p Original contains color illustrations
(RTOP 505-64-12-01)
(NASA-TM-108990; NAS 1.15:108990) Avail: CASI HC A03/MF A01; 3 functional color pages

An element of the NASA/FAA windshear program is the integration of ground-based microburst information on the flight deck, to support airborne windshear alerting and microburst avoidance. NASA conducted a windshear flight test program in the summer of 1991 during which airborne processing of Terminal Doppler Weather Radar (TDWR) data was used to derive microburst alerts. Microburst information was extracted from TDWR, transmitted to a NASA Boeing 737 in flight via data link, and processed to estimate the windshear hazard level (F-factor) that would be experienced by the aircraft in each microburst. The microburst location and F-factor were used to derive a situation display and alerts. The situation display was successfully used to maneuver the aircraft for microburst penetrations, during which atmospheric 'truth' measurements were made. A total of 19 penetrations were made of TDWR-reported microburst locations, resulting in 18 airborne microburst alerts from the TDWR data and two microburst alerts from the airborne reactive windshear detection system. The primary factors affecting alerting performance were spatial offset of the flight path from the region of strongest shear, differences in TDWR measurement altitude and airplane penetration altitude, and variations in microburst outflow profiles. Predicted and measured F-factors agreed well in penetrations near microburst cores. Although improvements in airborne and ground processing of the TDWR measurements would be required to support an airborne executive-level alerting protocol, the practicality of airborne utilization of TDWR data link data has been demonstrated. Dissert. Abstr.

N93-32332# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
INSTRUMENTATION FOR IN-FLIGHT ACOUSTIC MEASUREMENTS IN AN ENGINE INLET DUCT OF A FOKKER 100 AIRCRAFT
J. M. Klijn and E. R. Rademaker 28 May 1991 15 p Presented at the SFTE 22nd Annual Symposium, Saint Louis, MO, 5-9 Aug. 1991
(NLR-TP-91200-U; ETN-93-94060; AD-B169204L) Avail: CASI HC A03/MF A01

Acoustic measurements in the engine intake duct of the Fokker 100 test aircraft during flight were performed. One of the engines was provided with an instrumented intake to determine the circumferential modes of the sound field. A digital data acquisition system had to be developed. The technical requirements of the acoustic instrumentation, the selection of the transducers and a description of the new data acquisition system are presented. Some of the Fokker 100 test aircraft instruments are described. Extensive system checks, including environmental and calibration tests, were carried out before installing the system in the aircraft. Some results of these tests are presented. The flight test program and the data processing are described. It is concluded that during the flights, the new measurement system operated well. The required data concerning the prevailing acoustic modes was obtained. ESA

N93-31273# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.
THE BASIC MEASUREMENT EQUIPMENT OF THE DLR TEST AIRCRAFT
Helmut Bothe *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 31-44 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 35-48 Original language document was announced as N92-25592 (For primary document see N93-31271 12-04)
Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

N93-31279# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.
PALLET FOR HELICOPTER TEST INSTRUMENTATION
Georg Haehnlein and Peter Jaensch *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 115-156 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 114-153 Original language document was announced as N92-25598 (For primary document see N93-31271 12-04)
Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxilliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N93-31111# National Aerospace Lab., Amsterdam (Netherlands). Materials Dept.
PERFORMANCE OF GAS TURBINE COMPRESSOR CLEANERS
H. J. Kolkman 18 Jun. 1991 10 p Presented at 37th ASME International Gas Turbine and Aeroengine Congress and Exposition, Cologne, Germany, 1-4 Jun. 1992 Sponsored by Royal Netherlands Air Force, and Royal Netherlands Navy
(NLR-TP-91237-U; ETN-93-94064) Avail: CASI HC A02/MF A01

Deposits are regularly removed from compressor blades and vanes of installed jet engines and gas turbines by compressor washing. A compressor cleaner is sprayed into the compressor while operating at reduced or normal rpm. The cleaning efficiency of eight, old and new, compressor cleaners was determined. The experiments were performed by means of simulated compressor washing or compressor blades that had become foul in service. For the situation simulated, the cleaning efficiency of new, ecologically sound cleaners turned out to be poor as compared with old compressor cleaners. The corrosion inhibition offered by those cleaners that contain a corrosion inhibitor was found to be satisfactory. ESA

N93-31170# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Goettingen (Germany). Abt. fuer Numerische Stroemungsmechanik.
THE ViB-CODE TO SIMULATE 3-D STATOR/ROTOR FLOW IN AXIAL TURBINES
Achim Hilgenstock Jul. 1992 52 p Original contains color illustrations
(DLR-FB-92-19; ETN-93-93955) Avail: CASI HC A04/MF A01; DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

The numerical simulation of the flow through an axial turbine stage using a finite volume Navier-Stokes method is reported. The methods for selecting the optimal grid and the grid generation are outlined. Numerous improvements are integrated into an existing numerical method to improve the flexibility and to extend the range of application. With the introduced Chimera grid embedding technique, it is possible to solve the Navier-Stokes equations on overlapping meshes. In addition to the existing code, now the flow can also be simulated within cylindrical geometries, even in a rotating frame of reference as for example in the turbine rotor. The results obtained with the method described show the quasi-instationary three dimensional flow through an axial turbine stage with nonrotating stator and rotating rotor blade rows. ESA

N93-31671*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ENGINE TECHNOLOGY CHALLENGES FOR A 21ST CENTURY HIGH-SPEED CIVIL TRANSPORT
Robert J. Shaw, Samuel Gilkey (General Electric Co., Evendale, OH.), and Richard Hines (Pratt and Whitney Aircraft, East Hartford, CT.) Sep. 1993 13 p Proposed for presentation at the International Symposium on Air Breathing Engines, Tokyo, Japan, 20-24 Sep. 1993 Original contains color illustrations
(RTOP 537-02-00)
(NASA-TM-106216; E-7925; NAS 1.15:106216) Avail: CASI HC A03/MF A01; 3 functional color pages

Ongoing NASA-funded studies by Boeing, McDonnell-Douglas, General Electric, and Pratt & Whitney indicate that an opportunity exists for a 21st Century High-Speed Civil Transport (HSCT) to become a major part of the international air transportation system. However, before industry will consider an HSCT product launch and an investment estimated to be over $15 billion for design and certification, major technology advances must be made. An overview of the propulsion-specific technology advances that must be in hand before an HSCT product launch could be considered is presented. Author (revised)

N93-31741# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Structures and Materials Panel.
AGARD ENGINE DISC COOPERATIVE TEST PROGRAMME [RAPPORT SUR LE PROGRAMME D'ESSAIS COMMUN DES DISQUES MOTEUR (SUPPLEMENT)]
Apr. 1993 242 p
(AGARD-R-766-Add; ISBN-92-835-0709-6) Copyright Avail: CASI HC A11/MF A03

Fatigue and crack growth tests of Ti-Al6-4V, IMI 685, and Ti-17 specimens under constant amplitude and under variable amplitude TURBISTAN loading sequences at room temperature are described. Five crack growth models are evaluated and compared against experimental data. Microstructure and fractography data for the tested materials are also presented. For individual titles, see N93-31742 through N93-31749.

N93-31742# National Aerospace Lab., Amsterdam (Netherlands).
FRACTOGRAPHIC AND MICROSTRUCTURAL ANALYSIS OF FATIGUE CRACK GROWTH IN Ti-6Al-4V FAN DISC FORGINGS
R. J. H. Wanhill and C. E. W. Looije *In* AGARD, AGARD Engine Disc Cooperative Test Programme Apr. 1993 40 p (For primary document see N93-31741 12-07)
Copyright Avail: CASI HC A03/MF A03

The constant amplitude and flight simulation (TURBISTAN) fatigue crack growth behavior of Ti6Al-4V fan disc forgings tested in the AGARD engine disc cooperative test program was investigated by fractographic and microstructural analysis. The crack growth curve shapes and fractographic characteristics were similar. Transitions in the fatigue crack growth curves correlated with a change from structure-sensitive to continuum-mode crack growth, primarily in the transformed and aged Beta grains, and decreased fracture surface roughness. The transitions were most probably caused by the maximum plane strain cyclic plastic zone sizes becoming equal to and exceeding the average platelet Alpha packet sizes. The significance of such transitions for prediction of fatigue crack growth and service failure analysis is discussed. Author

N93-31743# Defence Research Agency, Farnborough (England).
FRACTOGRAPHIC INVESTIGATION OF IMI 685 CRACK PROPAGATION SPECIMENS FOR SMP SC33
Chris Wilkinson and Paul Heuler (Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn, Germany.) *In* AGARD, AGARD Engine Disc Cooperative Test Programme Apr. 1993 4 p (For primary document see N93-31741 12-07)
Copyright Avail: CASI HC A01/MF A03

Fracture surfaces from compact tension and corner crack specimens were examined for various complex waveforms. Features were related to the various stages of crack growth, as well as to the known response of the material. Author

N93-31744# Department of National Defence, Ottawa (Ontario). Quality Engineering Test Establishment.
MATERIAL CHARACTERIZATION AND FRACTOGRAPHIC EXAMINATION OF Ti-17 FATIGUE CRACK GROWTH SPECIMENS FOR SMP SC33
Marko Yanishevsky, Bryan Cornwall, and Martin Roth *In* AGARD, AGARD Engine Disc Cooperative Test Programme Apr. 1993 44 p (For primary document see N93-31741 12-07)
Copyright Avail: CASI HC A03/MF A03

Material characterization and metallographic examination of the Ti-17 material tested as part of the Supplemental Program for Engine Disc Damage

Tolerance Testing AGARD SC33 are included. As well, a complete fractographic examination is provided for the compact tension specimens tested under the six types of simple spectra load conditions and the four levels of load excursion damage level omission of the complex spectrum TURBISTAN, this latter spectrum representing NATO gas turbine engine missions used in fighter aircraft applications. Author (revised)

N93-31745# National Aerospace Lab., Amsterdam (Netherlands).
LOW CYCLE FATIGUE BEHAVIOUR OF TITANIUM DISC ALLOYS
C. E. W. Looije *In* AGARD, AGARD Engine Disc Cooperative Test Programme Apr. 1993 12 p (For primary document see N93-31741 12-07)
Copyright Avail: CASI HC A03/MF A03

The low cycle fatigue behavior of the titanium alloys IMI 685, Ti-17 and Ti-6Al-4V tested in the AGARD Engine Disc Cooperative Test Program are described. Load controlled low cycle fatigue tests were carried out on smooth cylindrical and flat double edge notched specimens at room temperature. The test results were statistically analyzed and discussed. The tests showed that the differences in low cycle fatigue behavior between IMI 685 and Ti-6Al-4V are negligible and that Ti-17 has superior low cycle fatigue properties. Author (revised)

N93-31746# Institute for Aerospace Research, Ottawa (Ontario).
FATIGUE CRACK GROWTH RESULTS FOR Ti-6Al-4V, IMI 685, AND Ti-17
M. D. Raizenne *In* AGARD, AGARD Engine Disc Cooperative Test Programme Apr. 1993 33 p (For primary document see N93-31741 12-07)
Copyright Avail: CASI HC A03/MF A03

The fatigue crack growth results for the titanium alloys IMI 685, Ti-6Al-4V and Ti- 17 that were tested in the Supplemental phase of the AGARD SC.33 Engine Disc Cooperative Test Program are presented. The fatigue crack growth work was carried out under load control using compact tension and corner crack specimen geometries. Tests were conducted under the following loading conditions: constant amplitude ($R = 0.1$ and $R = 0.7$), constant amplitude ($R = 0$) with minor cycles, an $R = 1.7$ single overload sequence and the cold TURBISTAN variable amplitude sequence. The data is presented using a point to point or secant method. The constant amplitude and single overload data base was subsequently used by five participating laboratories to predict a series of 60 load cases using their respective crack growth prediction models. Author (revised)

N93-31747# Centre d'Essais Aeronautique Toulouse (France).
CRACK GROWTH PREDICTION MODELS
Eric Jany and Paul Heuler (Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn, Germany.) *In* AGARD, AGARD Engine Disc Cooperative Test Programme Apr. 1993 6 p (For primary document see N93-31741 12-07)
Copyright Avail: CASI HC A02/MF A03

Seven companies or laboratories initially entered the exercise: CEAT, FFA, GE, NASA, NLR, Pratt & Whitney, and Rolls-Royce. Two of them withdrew (GE, Pratt & Whitney). A short description of the models and some information on how the data base was handled in order to carry out the predictions are presented. A list of references on each model is given. Author (revised)

N93-31748# Centre d'Essais Aeronautique Toulouse (France).
CRACK GROWTH PREDICTION RESULTS **c39**
Eric Jany, Olivier Renne, and Paul Heuler (Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn, Germany.) *In* AGARD, AGARD Engine Disc Cooperative Test Programme Apr. 1993 83 p (For primary document see N93-31741 12-07)
Copyright Avail: CASI HC A05/MF A03

Prediction results for the 60 test cases described previously are presented and discussed. The predictions were made by CEAT, NASA, FFA, NLR, and RR (who carried out only a limited number of cases) using the respective models. This chapter starts with a short consideration of criteria for the assessment of model predictions, presents an overview of the whole body of results followed by a discussion of aspects relevant to modeling of crack growth and application within the design process. Author (revised)

N93-31749# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (Germany).
CONCLUSIONS AND RECOMMENDATIONS **c39**
Paul Heuler, Walter Schuetz, and Eric Jany (Centre d'Essais Aeronautique Toulouse, France.) *In* AGARD, AGARD Engine Disc Cooperative Test Programme Apr. 1993 5 p (For primary document see N93-31741 12-07)
Copyright Avail: CASI HC A01/MF A03

Preceding chapters have presented and discussed the objectives related to this large collaborative effort as well as relevant test techniques, modeling details and results in great detail. In 1988 an AGARD report had been published on the results obtained within the Core Program which represents the first of two parts of the AGARD Engine Disc Cooperative Test Program. The major issues treated within the present Supplemental Program were: to expand the initial Ti-6Al-4V data base to other titanium materials such as the Beta-processed IMI 685 and Ti-17 (again load controlled LCF tests were carried out on smooth and notched specimens as well as crack growth tests on compact tension (CT) and corner crack (CC) specimens under constant amplitude loading); to consider variable amplitude and spectrum load sequences that would be typical of compressor disc loading conditions; and to apply and evaluate fatigue crack growth modeling techniques based on the material/load cases of the Cooperative Test Program as mentioned above. Additionally microstructural and fractographic analyses were undertaken in order to relate macro crack growth behavior to microstructural features and intrinsic material properties. In this final chapter, some main aspects and results are summarized. Conclusions and recommendations for future work are given. Author (revised)

N93-32220*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Facility, Edwards, CA.
ENGINE EXHAUST CHARACTERISTICS EVALUATION IN SUPPORT OF AIRCRAFT ACOUSTIC TESTING
Kimberly A. Ennix Jun. 1993 12 p Presented at the Society of Women Engineers National Conference, Chicago, IL, 21-27 Jun. 1993
(RTOP 537-03-20)
(NASA-TM-104263; H-1873; NAS 1.15:104263) Avail: CASI HC A03/MF A01

NASA Dryden Flight Research Facility and NASA Langley Research Center completed a joint acoustic flight test program. Test objectives were (1) to quantify and evaluate subsonic climb-to-cruise noise and (2) to obtain a quality noise database for use in validating the Aircraft Noise Prediction Program. These tests were conducted using aircraft with engines that represent the high nozzle pressure ratio of future transport designs. Test flights were completed at subsonic speeds that exceeded Mach 0.3 using F-18 and F-16XL aircraft. This paper describes the efforts of NASA Dryden Flight Research Facility in this flight test program. Topics discussed include the test aircraft, setup, and matrix. In addition, the engine modeling codes and nozzle exhaust characteristics are described. Author

N93-32351*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
PROPULSION TECHNOLOGY CHALLENGES FOR TURN-OF-THE-CENTURY COMMERCIAL AIRCRAFT
Joseph A. Ziemianski and Calvin L. Ball Jun. 1993 14 p Prepared for presentation at the 11th ISABE Conference, Tokyo, Japan, 20-24 Sep. 1993
(RTOP 505-62-10)
(NASA-TM-106192; E-7898; NAS 1.15:106192) Avail: CASI HC A03/MF A01

This paper highlights the efforts being performed or sponsored by NASA, in cooperation with the U.S. civil aviation industry, to address the propulsion system technological challenges that must be met in order to ensure a viable future for the industry. Both the subsonic and supersonic aeropropulsion programs are considered. Subsonic transport propulsion program elements, including ultra-high-bypass-ratio turbofans with attendant noise reduction efforts, high-efficiency cores, and combustor emissions reductions are discussed in terms of goals, technical issues, and problem solutions. Similarly, the high-speed research propulsion efforts addressing a high-speed commercial transport are reviewed in terms of environmental barrier issues, such as oxides of nitrogen and noise reduction, and the related economic issues. Author (revised)

N93-32368*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

INITIAL RESULTS FROM THE NASA-LEWIS WAVE ROTOR EXPERIMENT

Jack Wilson (Sverdrup Technology, Inc., Brook Park, OH.) and Dennis Fronek May 1993 11 p Presented at the AIAA, SAE, ASME, and ASEE 29th Joint Propulsion Conference and Exhibit, Monterey, CA, 28 Jun. - 1 Jul. 1993; sponsored by AIAA

(RTOP 505-62-10)

(NASA-TM-106148; E-7831; NAS 1.15:106148; AIAA Paper 93-2521)

Avail: CASI HC A03/MF A01

Wave rotors may play a role as topping cycles for jet engines, since by their use, the combustion temperature can be raised without increasing the turbine inlet temperature. In order to design a wave rotor for this, or any other application, knowledge of the loss mechanisms is required, and also how the design parameters affect those losses. At NASA LeRC, a 3-port wave rotor experiment operating on the flow-divider cycle, has been started with the objective of determining the losses. The experimental scheme is a three factor Box-Behnken design, with passage opening time, friction factor, and leakage gap as the factors. Variation of these factors is provided by using two rotors, of different length, two different passage widths for each rotor, and adjustable leakage gap. In the experiment, pressure transducers are mounted on the rotor, and give pressure traces as a function of rotational angle at the entrance and exit of a rotor passage. In addition, pitot rakes monitor the stagnation pressures for each port, and orifice meters measure the mass flows. The results show that leakage losses are very significant in the present experiment, but can be reduced considerably by decreasing the rotor to wall clearance spacing.

Author (revised)

N93-32372# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.

LOW CYCLE FATIGUE BEHAVIOUR OF TITANIUM DISC ALLOYS

C. E. W. Looije 9 Sep. 1991 17 p Presented at AGARD Subcommittee 33 on Engine Disc Cooperative Test Programme

(NLR-TP-91346-U; ETN-93-94069; AD-B168790L) Avail: CASI HC A03/MF A01

The low cycle fatigue behavior of the titanium alloys IMI 685, Ti-17, and Ti-6Al-4V is described. The specimens were extracted from fan disc forgings provided by Rolls-Royce and General Electric. The forgings were in the solution treated and aged conditions. The Ti-6Al-4V was (alpha + beta) processed, while the IMI 685 and Ti-17 were beta processed. Load controlled low cycle fatigue tests were carried out on smooth cylindrical and flat double edge notched specimens at room temperature. The test results were statistically analyzed and discussed. The tests showed that the differences in low cycle fatigue behavior between IMI 685 and Ti-6Al-4V are negligible and that Ti-17 has superior low cycle fatigue properties.

ESA

N93-32374*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

ANALYTICAL AND EXPERIMENTAL INVESTIGATIONS OF THE OBLIQUE DETONATION WAVE ENGINE CONCEPT

Gene P. Menees, Henry G. Adelman (Eloret Corp., Palo Alto, CA.), and Jean-Luc Cambier (Eloret Corp., Palo Alto, CA.) Feb. 1991 18 p Presented at the AGARD PEP 75th Symposium, Madrid, Spain, 28 May - 1 Jun. 1990 Previously announced as N91-23169

(RTOP 506-62-31)

(NASA-TM-102839; A-90195; NAS 1.15:102839) Avail: CASI HC A03/MF A01

Wave combustors, which include the Oblique Detonation Wave Engine (ODWE), are attractive propulsion concepts for hypersonic flight. These engines utilize oblique shock or detonation waves to rapidly mix, ignite, and combust the air-fuel mixture in thin zones in the combustion chamber. Benefits of these combustion systems include shorter and lighter engines which will require less cooling and can provide thrust at higher Mach numbers than conventional scramjets. The wave combustor's ability to operate at lower combustor inlet pressures may allow the vehicle to operate at lower dynamic pressures which could lessen the heating loads on the airframe. The research program at NASA-Ames includes analytical studies of the ODWE combustor using CFD codes which fully couple finite rate chemistry with fluid dynamics. In addition, experimental proof-of-concept studies are being carried out in an arc heated hypersonic wind tunnel. Several fuel injection designs were studied analytically and experimentally. In-stream strut fuel injectors were chosen to provide good mixing with minimal stagnation pressure losses. Measurements of flow field properties behind the oblique wave are compared to analytical predictions.

Author (revised)

N93-32386# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.

TRANSMISSION OF SOUND THROUGH A ROTOR

J. B. H. M. Schulten 29 Jan. 1992 13 p Presented at the DGLR/AIAA 14th Aeroacoustic Conference, Aachen, Germany, 11-14 May 1992

(NLR-TP-92014-U; ETN-93-94079; AD-B169664L) Avail: CASI HC A03/MF A01

The dominant sound of a turbofan engine is usually generated by rotor wakes when they impinge on a downstream stator. Consequently, to reach the intake the sound waves must pass the rotor. The rotating blades represent an obstacle that partly reflects and partly transmits the incident sound field. The calculation of this process is by means of a three dimensional lifting surface approximation of the rotor. It is shown that the reflection-transmission process can be treated as an unsteady aerodynamic problem. The method is illustrated by numerical examples. The results show that, depending on the relative angle of incidence of the sound waves, the shielding effect of the rotor can yield a reduction from negligible up to the order of 30 dB in acoustic power.

ESA

N93-32272# Imperial Coll. of Science and Technology, London (England).

STRUCTURAL DYNAMIC CHARACTERISTICS OF INDIVIDUAL BLADES

D. J. Ewins and R. Henry (Institut National des Sciences Appliquees, Lyon, France.) *In* VKI, Vibration and Rotor Dynamics 1992 28 p Repr. from AGARD Manual on Aeroelasticity in Axial-Flow Turbo Machines. Volume 2: Structural Dynamics and Aeroelasticity 27 p Previously announced as N89-10008 (For primary document see N93-32270 12-39)

Copyright Avail: CASI HC A03/MF A04

N93-32273# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.

STRUCTURAL DYNAMIC CHARACTERTISTICS OF BLADED ASSEMBLIES

D. J. Ewins *In* VKI, Vibration and Rotor Dynamics 1992 38 p Repr. from AGARD Manual on Aeroelasticity in Axial-Flow Turbo Machines. Volume 2: Structural Dynamics and Aeroelasticity 37 p Previously announced as N89-10009 (For primary document see N93-32270 12-39)

Copyright Avail: CASI HC A03/MF A04

N93-32274# Liege Univ. (Belgium).

VIBRATION ANALYSIS IN TURBOMACHINES

Michel Geradin, N. Kill, and J. C. Golinval *In* VKI, Vibration and Rotor Dynamics 1992 123 p Prepared in cooperation with Samtech S.A., Liege, Belgium (For primary document see N93-32270 12-39)

Copyright Avail: CASI HC A06/MF A04

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

For related information see also *05 Aircraft Design, Testing and Performance.*

N93-31068 Stanford Univ., CA.

EXPERIMENTS IN THE CONTROL OF WING ROCK AT HIGH ANGLE OF ATTACK USING TANGENTIAL LEADING EDGE BLOWING Ph.D. Thesis

Grant Sure-Man Wong 1993 204 p

Avail: Univ. Microfilms Order No. DA9309684

Supermaneuverability of highly swept delta wing aircraft requires operation in regions of the flight envelope where very high angles-of-attack are encountered. In these regions, the vortical flow on the lee side of the wing characteristic of highly swept wings at low to moderate angles-of-attack

becomes highly unsteady and disappears completely. Conventional control surfaces operating in the wake of such stalled flow are incapable of generating the necessary forces and moments to control the aircraft. The investigation is motivated by the success of recent research in the use of thin, high momentum jet sheets blown tangentially along the wing leading edges as a means to reestablish and to control directly the vortical flow at post-stall angles-of-attack. It is found presently that a good strategy for generating linear roll control torque is to first blow symmetrically, i.e., blowing equally along both leading edges of the wing. This produces a controllable attached flow. Then by asymmetrically increasing the blowing strength along either the left or the right leading edge, positive or negative rolling moment is generated. It is this resultant rolling moment that is used to control the rolling motion of the wing. A parametric semi-empirical aerodynamics model is developed to simulate the static effects of tangential leading edge blowing on both the vortical flow field and the resulting wing rolling moment. Parameters of the model are identified from experimental data by means of a least-squares parameter identification method. The completed aerodynamics model is coupled with a one-degree-of-freedom dynamics model to simulate the natural, i.e., wing rock, and the controlled wing rolling behavior. Fidelity of the parametric models is verified by comparing simulated roll responses with experimental wind tunnel data. An active feedback control algorithm is designed to regulate the amount of asymmetric blowing to achieve roll control. The effectiveness of tangential leading edge blowing as a roll control device is demonstrated experimentally in wind tunnel tests by the stabilization of a delta wing model which underwent wing rock at an angle-of-attack of fifty-five degrees.

Dissert. Abstr.

N93-32380*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

A HIGH-FIDELITY, SIX-DEGREE-OF-FREEDOM BATCH SIMULATION ENVIRONMENT FOR TACTICAL GUIDANCE RESEARCH AND EVALUATION

Kenneth H. Goodrich Washington Jul. 1993 53 p

(RTOP 505-64-30-01)

(NASA-TM-4440; L-17096; NAS 1.15:4440) Avail: CASI HC A04/MF A01

A batch air combat simulation environment, the tactical maneuvering simulator (TMS), is presented. The TMS is a tool for developing and evaluating tactical maneuvering logics, but it can also be used to evaluate the tactical implications of perturbations to aircraft performance or supporting systems. The TMS can simulate air combat between any number of engagement participants, with practical limits imposed by computer memory and processing power. Aircraft are modeled using equations of motion, control laws, aerodynamics, and propulsive characteristics equivalent to those used in high-fidelity piloted simulations. Data bases representative of a modern high-performance aircraft with and without thrust-vectoring capability are included. To simplify the task of developing and implementing maneuvering logics in the TMS, an outer-loop control system, the tactical autopilot (TA), is implemented in the aircraft simulation model. The TA converts guidance commands by computerized maneuvering logics from desired angle of attack and wind-axis bank-angle inputs to the inner loop control augmentation system of the aircraft. The capabilities and operation of the TMS and the TA are described. Author

N93-31278# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.

TESTING CONCEPT OF A TAXIING CONTROL SYSTEM, SUMMARY

A. Becker *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 104-114 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 105-113 Original language document was announced as N92-25597 (For primary document see N93-31271 12-04)

Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

N93-31280# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.

DEVELOPMENT AND FLIGHT TESTING OF A FAULT-TOLERANT FLY-BY-LIGHT YAW CONTROL SYSTEM

G. Mansfeld, K. Bender, and J. Tersteegen *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 157-183 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 154-176 Original language document was announced as N92-25599 (For primary document see N93-31271 12-04)

Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N93-31042# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.

A BREAK-DOWN OF STING INTERFERENCE EFFECTS

A. Elsenaar and S. O. T. H. Han 1 May 1991 66 p Presented at DGLR/DNW Symposium on Model Support Corrections in Wind Tunnels, DNW, Marknesse, Netherlands, 16-17 May 1991

(NLR-TP-91220-U; ETN-93-94063) Avail: CASI HC A04/MF A01

Results from long static pipe measurements, from wind tunnel tests, and theoretical calculations were compared. A correction procedure for the assessment of model support effects for arbitrary model support configurations is discussed. In this procedure a distinction between 'near field', to be determined from dummy sting measurements, and 'far field', to be calculated by theory, contributions is made. Experimental results obtained for two different model support systems were used to evaluate the correction procedure. A good agreement is found in lift and pitching moment after the corrections. The corrected drag polars show a similar lift dependence but an as yet unexplained difference in drag level. ESA

N93-31836*# Old Dominion Univ., Norfolk, VA. Dept. of Mechanical Engineering and Mechanics.

LARGE ANGLE MAGNETIC SUSPENSION TEST FIXTURE Progress Report, 1 Nov. 1992 - 31 May 1993

Colin P. Britcher Jun. 1993 80 p

(Grant NAG1-1056)

(NASA-CR-193123; NAS 1.26:193123) Avail: CASI HC A05/MF A01

Progress made under the subject grant in the period from 1 Nov. 1992 to 31 May 1993 is presented. The research involves the continued development of the Large Angle Magnetic Suspension Test Fixture (LAMSTF) and also the recommissioning of an additional piece of exisiting hardware. During the period in question, the initial configuration of LAMSTF was completed and made routinely and reliably operational. A digital phase advance controller was completed and documented. The goal of a controlled 360 deg rotation was achieved. Work started on the recommissioning of the Annular Suspension and Pointing System (ASPS). Work completed during the report period included: modeling; position sensing; controller; support of the Second International Symposium on Magnetic Suspension Technology; and recommissioning of the Annular Suspension and Pointing System. Author (revised)

N93-31848*# Hampton Univ., VA. Dept. of Engineering.

EVALUATION OF CANDIDATE WORKING FLUID FORMULATIONS FOR THE ELECTROTHERMAL-CHEMICAL WIND TUNNEL Final Report

Jale F. Akyurtlu and Ates Akyurtlu 1993 28 p

(Grant NAG1-767)

(NASA-CR-193366; NAS 1.26:193366) Avail: CASI HC A03/MF A01

A new hypersonic test facility which can simulate conditions typical of atmospheric flight at Mach numbers up to 20 is currently under study at the NASA/LaRC Hypersonic Propulsion Branch. In the proposed research, it was suggested that a combustion augmented electrothermal wind tunnel concept may be applied to the planned hypersonic testing facility. The purpose of the current investigation is to evaluate some candidate working fluid formulations which may be used in the chemical-electrothermal wind. The efforts in the initial phase of this research were concentrated on acquiring the code used by GASL to model the electrothermal wind tunnel and testing it using the conditions of GASL simulation. The early version

of the general chemical kinetics code (GCKP84) was obtained from NASA and the latest updated version of the code (LSENS) was obtained from the author Dr. Bittker. Both codes are installed on a personal computer with a 486 25 MHz processor and 16 Mbyte RAM. Since the available memory was not sufficient to debug LSENS, for the current work GCKP84 was used. Derived from text

N93-31916# Army Research Lab., Aberdeen Proving Ground, MD.
NUMERICAL SIMULATION OF THE FLOW IN A 1:57-SCALE AXISYMMETRIC MODEL OF A LARGE BLAST SIMULATOR Final Report, 15 Jan. - 31 Dec. 1992
Klaus O. Opalka Apr. 1993 35 p
(AD-A265551; ARL-TR-111) Avail: CASI HC A03/MF A01

This report presents an assessment of the suitability of the USA-RG2 hydrocode for simulating the flow in a variable-area shock tunnel. A multi-zone gridding technique is used to model the 1:57-Scale LBS test facility at the U.S. Army Research Laboratory. Computations for various grid configurations employing inviscid and viscous solution algorithms and three turbulence models were executed and the results are compared to experimental data. The need for an adequate mesh density in the grid to obtain a realistic flow simulation and the advantage of solving the full Navier-Stokes equations with added k-epsilon turbulence model for the experiment chosen as a bench mark are demonstrated. DTIC

N93-31274# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.
GROUND INSTALLATIONS FOR PREPARATION AND EVALUATION OF FLIGHT TESTS
G.-J. Barth *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 45-53 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 49-56 Original language document was announced as N92-25593 (For primary document see N93-31271 12-04)
Avail: CASI HC A02/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

N93-31276# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.
ATTAS EXPERIMENTAL-COCKPIT AND ATMOS FOR COMPONENT AND SYSTEM INVESTIGATIONS IN FLIGHT GUIDANCE
Ralf Beyer *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 69-82 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 71-84 Original language document was announced as N92-25595 (For primary document see N93-31271 12-04)
Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N93-31312*# National Aeronautics and Space Administration, Washington, DC.
NASA ENGINEERING AND TECHNOLOGY ADVANCEMENT OFFICE: A PROPOSAL TO THE ADMINISTRATOR
Norman R. Schulze 28 Mar. 1993 85 p
(NASA-TM-109229; NAS 1.15:109229) Avail: CASI HC A05/MF A01

NASA has continually had problems with cost, schedule, performance, reliability, quality, and safety aspects in programs. Past solutions have not provided the answers needed, and a major change is needed in the way of doing business. A new approach is presented for consideration. These problems are all engineering matters, and therefore, require engineering solutions. Proper engineering tools are needed to fix engineering problems. Headquarters is responsible for providing the management structure to support programs with appropriate engineering tools. A guide to define those tools and an approach for putting them into place is provided. Recommendations include establishing a new Engineering and Technology Advancement Office, requesting a review of this proposal by the Administrator since this subject requires a top level decision. There has been a wide peer review conducted by technical staff at Headquarters, the Field Installations, and others in industry as discussed. Derived from text

N93-32319# Naval Postgraduate School, Monterey, CA.
A PARAMETRIC ANALYSIS OF ENDOATMOSPHERIC LOW-EARTH-ORBIT MAINTENANCE M.S. Thesis
Mark S. Wilsey Mar. 1993 82 p
(AD-A265868) Avail: CASI HC A05/MF A01

With the advent of long term low Earth-orbiting satellites comes the requirement to maintain a specified orbital radial band. Optimal control theory suggests that periodic thrusting is more efficient than forced Keplerian motion in orbital maintenance through the use of primer vectoring. This thesis examined the efficiency of fixed-angle transverse thrusting as an alternative to primer vectoring. Numerical analysis shows that a thrust angle of 65-70 degrees is feasible for radial band control for a wide range of parameters. Fuel usage can be minimized through the proper selection of radial bandwidth, thruster size, and thrust angle. This thesis shows that forced Keplerian motion is always superior to fixed-angle transverse thrusting from a fuel usage standpoint, and hence that thrust vectoring must be utilized. DTIC

N93-31451*# McDonnell-Douglas Space Systems Co., Cocoa Beach, FL.
PATH PLANNING CONTROL
Malcolm McRoberts *In its* Workshop on Fuzzy Control Systems and Space Station Applicatons Nov. 1990 p 367-372 (For primary document see N93-31439 12-18)
Avail: CASI HC A02/MF A04

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbital and launching dynamics.

N93-31207# Technische Univ., Berlin (Germany). Inst. fuer Luft- und Raumfahrt.
SYSTEM STUDY OF TETHER TECHNOLOGY WITH PARTICULAR CONSIDERATION OF TRANSPORT UTILIZATION POSSIBILITIES IN SPACE TRANSPORTATION [SYSTEMSTUDIE UEBER TETHERTECHNIK UNTER BESONDERER BERUECKSICHTIGUNG DER TRANSPORTSPEZIFISCHEN ANWENDUNGSMOEGLICHKEITEN IN DER RAUMFAHRT]
A. Eckert, M. Thierschmann, and R. E. Lo Apr. 1992 123 p In GERMAN
(ILR-Mitt-270(1992); ETN-93-94459) Avail: CASI HC A06/MF A02

Theoretical fundamentals of the technology of tethers and possibilities of the practical employment of tethered space flight systems are discussed such as an orbital refueling facility for an orbital transfer vehicle, electrodynamic tether system for raising space stations, kinetic isolation transfer experiment and tethered satellite systems. The range of potential applications of tethers in space was thoroughly examined and systemized. On the basis of this classification a method of feasibility assessment was developed. An illustrative system analysis was performed on three selected concepts of tether supported payload transfer, which are tethered elevator, electrodynamic tether system for energy supply and boosting/deboosting tether system. ESA

N93-31318# Alcatel Espace, Toulouse (France). Ground Systems Dept.
DIGITAL PROCESSING FOR POSITIONING WITH ONE SATELLITE
A. Marguinaud 1992 12 p Previously announced as N93-23629
(ETN-93-93732) Avail: CASI HC A03/MF A01

Theoretical and practical work with geostationary and low Earth orbiting (SARSAT) satellites is presented. Reliability, efficiency, and cost considerations have resulted in an all digital implementation with standard processors. The analog signal is represented by complex samples calculated from real sampling with an algorithm based on an original concept. Any telecommunication (or radar) signal is represented by reversible transformations of a sinusoidal carrier. Maximum likelihood synchronization and demodulation must be used and consists of reconstructing the 'best' carrier from the received signal. Depending on the uncertainty level, one

tries a certain number of time-frequency hypotheses, and for each hypothesis, one makes optimum estimations of three carrier parameters: modulus, phase, and frequency. Since one deals with one circular function, it is straightforward to develop the phase, so that phase and frequency are the two parameters defining a straight line on the developed phase-time plane. The two corresponding estimators are decorrelated. For a terrestrial vehicle, a good estimation of its velocity can be made, and even for a stationary satellite there is an apparent periodical known motion, which can be used to locate the vehicle by a convenient combination of elementary estimations. Some frequency spreading, clock stability, and delay are necessary, but explicit performance is easy to derive as functions of operational conditions. Analysis of numerical results may suggest useful practical systems. ESA

N93-32081# Naval Research Lab., Washington, DC.
ORBIT ANALYSIS TOOLS SOFTWARE USER'S MANUAL, VERSION 1
Alan S. Hope and Jay Middour 15 Apr. 1993 67 p
(AD-A265012; NRL/MR/8103-93-7307) Avail: CASI HC A04/MF A01

In the course of our work in mission planning and analysis we have developed a set of computer programs that address many of the questions commonly asked by designers when planning a new satellite system and by managers wishing to assess the performance of an existing system. The Orbit Analysis Tools Software (OATS) is an organization of this collection of computer programs unified by a single graphical user interface. The graphical and tabular output from OATS may be printed directly from the program or cut and pasted via the clipboard into any other Macintosh application program. The FaceIt1 utility is used to establish the interface between the FORTRAN code and the Macintosh Toolbox. DTIC

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air).*

N93-32178# Department of Energy, Idaho Falls, ID. Field Office.
THE APPLICABILITY AND AVAILABILITY OF FORMER SOVIET UNION (FSU) SPACE-RELATED CAPABILITIES AND FACILITIES TO ENERGY-RELATED SPACE ACTIVITIES OF DEPARTMENT OF ENERGY, DEPARTMENT OF DEFENSE AND NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
M. Pellechi 27 Jan. 1993 68 p
(DE93-010286; DOE/FTR-93010286) Avail: CASI HC A04/MF A01 (US Sales Only)

A senior-level Department of Energy (DOE), Department of Defense (DoD), and National Aeronautics and Space Administration (NASA) team visited the former Soviet Union (FSU) from 16-28 Oct. 1992. The purpose of the visit was to investigate the applicability and availability of FSU space-related capabilities and facilities to the energy-related space activities of the three agencies. This included renewable energy, nuclear power and propulsion, radiation effects, remote sensing, optics, and lasers. The U.S. delegation was successful in identifying some capabilities that would be useful to the three organizations. Efforts to utilize some of the FSU capabilities viewed are being initiated. Concurrently, there will be a technical assessment performed on the information gained from this and other recent visits to the FSU relative to space research. DOE

N93-32236*# Mississippi State Univ., Mississippi State. Dept. of Electrical and Computer Engineering.
DATA COMMUNICATION NETWORK AT THE ASRM FACILITY Report No. 3, 6 Feb. 1993 - 5 Feb. 1994
Robert J. Moorhead, II and Wayne D. Smith 6 Aug. 1993 78 p
(Grant NAG8-866)
(NASA-CR-193625; NAS 1.26:193625) Avail: CASI HC A05/MF A01

This report describes the simulation of the overall communication network structure for the Advanced Solid Rocket Motor (ASRM) facility being built at Yellow Creek near Iuka, Mississippi as of today. The report is compiled using information received from NASA/MSFC, LMSC, AAD, and RUST Inc. As per the information gathered, the overall network structure will have one logical FDDI ring acting as a backbone for the whole complex. The buildings will be grouped into two categories viz. manufacturing intensive and manufacturing non-intensive. The manufacturing intensive buildings will be connected via FDDI to the Operational Information System (OIS) in the main computing center in B—1000. The manufacturing non-intensive buildings will be connected by 10BASE-FL to the OIS through the Business Information System (BIS) hub in the main computing center. All the devices inside B—1000 will communicate with the BIS. The workcells will be connected to the Area Supervisory Computers (ASCs) through the nearest manufacturing intensive hub and one of the OIS hubs. Comdisco's Block Oriented Network Simulator (BONeS) has been used to simulate the performance of the network. BONeS models a network topology, traffic, data structures, and protocol functions using a graphical interface. The main aim of the simulations was to evaluate the loading of the OIS, the BIS, and the ASCs, and the network links by the traffic generated by the workstations and workcells throughout the site. Author (revised)

N93-32122*# Air Force Systems Command, Kelly AFB, TX. Robotics and Automation Center of Excellence.
RACE PULLS FOR SHARED CONTROL
M. B. Leahy, Jr. and B. K. Cassiday *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 205-211 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32123*# Air Force Systems Command, Wright-Patterson AFB, OH. Manufacturing Technology Directorate.
AUTOMATED ASSEMBLY CENTER (AAC) Abstract only
Robert J. Stauffer *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 212 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles.

For related information see also *20 Spacecraft Propulsion and Power.*

N93-31670*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
LUBRICATION OF AN 85-mm BALL BEARING WITH RP-1
Harold E. Addy, Jr. and Frederick T. Schuller (Sverdrup Technology, Inc., Brook Park, OH.) Jun. 1993 11 p Presented at the 29th AIAA Joint Propulsion Conference and Exhibit, Monterey, CA, 28-30 Jun. 1993; sponsored by AIAA, SAE, ASME, and ASEE
(RTOP 584-03-11)
(NASA-TM-106254; E-7978; NAS 1.15:106254; AIAA Paper 93-2538)
Avail: CASI HC A03/MF A01

A parametric experimental investigation of an 85 millimeter bore angular contact ball bearing running in RP-1 fuel was performed at speeds of 10000 to 24000 RPM. Thrust loads were varied from 4450 to 17800 Newtons (1000 to 4000 lbs.). Radial loads were varied from 1335 to 13350 Newtons (300 to 3000 lbs.). RP-1 lubrication for the bearing was provided through a stationary jet ring located adjacent to the test bearing outer ring. Increases in both the thrust and radial loads resulted in increased bearing temperature, while increases in shaft speed resulted in much more dramatic increases in bearing temperature. These trends are typical for ball bearings operating under these types of conditions. Results are given for outer ring temperatures of the test bearing at the various test conditions employed. In addition, the heat energy removed from the bearing by the RP-1 was determined by measuring the increase in temperature as the RP-1 passed through the bearing. Results showed that the amount of heat energy removed by the RP-1 increased with both shaft speed and RP-1 flow rate to the bearing. Author

N93-32074# Army Research Lab., Aberdeen Proving Ground, MD.
A SURVEY OF CODES FOR MODELING ELECTROMAGNETIC LAUNCH Final Report, Mar. - Sep. 1992
William H. Drysdale, John D. Powell, Bruce P. Burns, and Alexander E. Zielinski May 1993 22 p
(AD-A264946; ARL-MR-64) Avail: CASI HC A03/MF A01

The state-of-the-art in numerical modeling of electromagnetic (EM) railgun launch phenomenology is assessed. It is concluded that among the extensive list of available codes, only two satisfy all of the requirements for electrodynamic calculations. Based on this assessment, recommendations to obtain and validate an EM modeling capability are presented.
Author (DTIC)

N93-32379*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
THE X-15/HL-20 OPERATIONS SUPPORT COMPARISON
W. Douglas Morris Washington Jun. 1993 18 p
(RTOP 906-11-01-01)
(NASA-TM-4453; L-17190; NAS 1.15:4453) Avail: CASI HC A03/MF A01

During the 1960's, the United States X-15 rocket-plane research program successfully demonstrated the ability to support a reusable vehicle operating in a near-space environment. The similarity of the proposed HL-20 lifting body concept in general size, weight, and subsystem composition to that of the X-15 provided an opportunity for a comparison of the predicted support manpower and turnaround times with those experienced in the X-15 program. Information was drawn from both reports and discussions with X-15 program personnel to develop comparative operations and support data. Based on the assumption of comparability between the two systems, the predicted staffing levels, skill mix, and refurbishment times of an operational HL-20 appear to be similar to those experienced by the X-15 for ground support. However, safety, environmental, and support requirements have changed such that the HL-20 will face a different operating environment than existed at Edwards during the 1950's and 1960's. Today's operational standards may impose additional requirements on the HL-20 that will add to the maintenance and support burden estimate based on the X-15 analogy.
Author

N93-32113*# Air Force Civil Engineering Center, Tyndall AFB, FL. Civil Engineering Support Agency.
FIRE PROTECTION FOR LAUNCH FACILITIES USING MACHINE VISION FIRE DETECTION
Douglas B. Schwartz *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 156-162 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques.

For related information see also *03 Air Transportation and Safety* and *18 Spacecraft Design, Testing and Performance.* For space suits see *54 Man/System Technology and Life Support.*

N93-31593# European Space Agency, Paris (France).
EVALUATION OF FUTURE SPACE TRANSPORTATION SYSTEMS WITH REGARD TO THEIR RELIABILITY AND COSTS
Lutz vonEntress-Fuersteneck (Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Lampoldshausen, Germany.) Jan. 1993 247 p Transl. into ENGLISH of Bewertung zukuenftiger Raumtransportsysteme hinsichtlich ihrer Zuverlaessigkeiten und Kosten (Lampoldshausen, Germany, DLR), Jul. 1991 p 1-216 Original language document was announced as N92-28826
(ESA-TT-1281; DLR-FB-91-27; ETN-93-93919) Avail: CASI HC A11/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

The functional relationships between technological system development, system reliability and system costs of arbitrary launcher systems, from the viewpoint of various design configurations are ascertained, and parameters for optimization of total costs are modified. Analytical and statistical investigations into the subsidiary field of system reliability provide proof of the existence of specific empirical values. They also illustrate two opposing trends in system characteristics: a learning processs and the readiness to take risks. Mass and cost analyses are based on modified estimation equations which are expanded by design criteria. It is demonstrated that the design criteria of the various launcher configurations, as well as system technology, exert an additional effect in the costs of assemblies. The result is a multifunctional, numerical software package which forecasts the system reliability of arbitrary launcher configurations over a given number of launches, and on that basis provides estimation of costs arising in addition to planned system costs. The specific costs of defined launcher systems are optimized by final parameter modifications.
ESA

17 SPACE COMM., SPACECRAFT COMM., COMMAND & TRACKING

Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance, 39 Structural Mechanics,* and *16 Space Transportation.*

N93-31069 Auburn Univ., AL.
A METHOD TO PREDICT THE ORBITAL LIFETIMES OF FREE TETHERS AND TETHER-TRAILING SATELLITES USING ARTIFICIAL NEURAL NETWORKS Ph.D. Thesis
Ted Wesley Warnock 1992 260 p
Avail: Univ. Microfilms Order No. DA9306596

The development of a method to predict the orbital lifetimes of uncontrolled free tethers and tether-trailing satellites originating in low-to-moderate altitude Earth orbits is discussed. The problem is solved by application of the 'empirical method.' Two mathematical models to simulate the orbital evolution of tethered systems are developed. In both models the system is discretized into a series of interconnected point masses, orbiting an oblate Earth and transiting an oblate, rotating, temporally and globally averaged atmosphere. For aerodynamic drag calculations, tether segments are modeled as right circular cylinders, and any end-body is modeled as a sphere. Drag coefficients vary as a function of shape and Knudsen number. In the 'multibody model', connections between masses are elastic, and the system is free to assume any orientation. Newtonian equations of motion are numerically integrated. In the 'orbital element propagation model', connections between masses are inelastic, and the system is constrained to remain aligned along the local vertical. Gauss' form of Lagrange's Planetary Equations, in terms of equinoctial elements, are used to propagate the orbital elements describing the orbit of the system's center of mass. The element propagation model is shown to provide, for initially unstretched systems aligned along the local vertical, accurate results, very quickly, as compared to those obtained using the multibody model. An algorithm to train feed-forward artificial neural networks, by minimizing the sum of the squares of percent errors, is derived and shown to be invaluable in training networks to represent widely-spread real-valued data. A hybrid training approach, using the derived algorithm in conjunction with the standard back propagation training algorithm, is described and demonstrated. This approach often reduces network training

time, and it is used to train three networks with lifetime data provided by the element propagation model: one to predict the orbital lifetimes of free tethers, one to predict lifetimes of upward-deployed subsatellites trailing a tether, and one to provide correction factors that account for the effects of initial orbit inclination and argument of latitude. The accuracies of network-predicted lifetimes, as compared to those obtained using the multibody model, are demonstrated in 90 cases with randomly chosen initial conditions and system physical dimensions. In all cases, the network's results are shown to be accurate to within plus or minus 20 percent of results obtained using the multibody model. Dissert. Abstr.

N93-31076# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation.

MATHEMATICAL SIMULATION OF THE INDUCED GAMMA-RADIATION IN STRUCTURAL MATERIALS OF SPACESHIPS

V. S. Barashenkov, A. N. Sosnin, P. I. Taranenko (Moscow Physical-Engineering Inst., Russia.), and S. N. Fedotov (Moscow Physical-Engineering Inst., Russia.) 1991 7 p
(DE93-606751; JINR-R-2-91-241) Avail: CASI HC A02/MF A01 (US Sales Only)

A Monte-Carlo model of internuclear cascades, supplemented with a program calculating the gamma-radiation spectra, emitted by excited aftercascade nuclei is used to investigate characteristics of induced gamma-activity in structural materials Al, Ti, Fe, W, Pb, and in one of the alloys exposed to the influence of cosmic particles and albedo neutrons on close-to-earth orbits. Spectral distributions of activational gamma-radiation are calculated. It is shown that the induced radioactivity is comparable and in some of the energy intervals even exceeds the background gamma-radiation on the orbit. DOE

N93-31157 York Univ., Toronto (Ontario).

THE INTERACTION OF A MOVING SPACECRAFT WITH THE IONOSPHERE: CURRENT COLLECTION AND WAKE STRUCTURE Ph.D. Thesis

George Zhequn Xu 1992 220 p
Avail: Univ. Microfilms Order No. DANN72903

This thesis presents a numerical study of the interaction of a cylindrical probe, such as a spacecraft or a plasma diagnostic probe, with a collisionless, drifting Maxwellian plasma. The ion current collection and wake structure of such a moving probe are investigated over a range of plasma parameters simulating the plasma environment in the ionosphere. The numerical model takes into account the asymmetric sheath surrounding the probe and the effect of ion thermal motions. The collected ion current is found theoretically to display a nonmonotonic dependence on the drift velocity for an infinite cylindrical probe. The combined increasing ram-effect of drifting ions and shadowing effect of the probe are proposed to be the cause of this nonmonotonic current behavior. A strong damping effect due to the ion thermal motions is seen to alter the wake structure significantly under various plasma parameters. The influences of varying the probe bias and drift velocity on the wake structure are also shown for different probe sizes. Dissert. Abstr.

N93-31439*# McDonnell-Douglas Space Systems Co., Huntington Beach, CA. Space Station Div.

WORKSHOP ON FUZZY CONTROL SYSTEMS AND SPACE STATION APPLICATIONS

E. K. Aisawa, comp. and R. M. Faltisco, comp. (McDonnell-Douglas Space Systems Co., Houston, TX.) Nov. 1990 447 p Workshop presented at Huntington Beach, CA, 14-15 Nov. 1990 Sponsored in part by MDSSC-SSD and NASA Ames Research Center
(NASA-CR-193202; NAS 1.26:193202; MDC-H6821) Avail: CASI HC A19/MF A04

The Workshop on Fuzzy Control Systems and Space Station Applications was held on 14-15 Nov. 1990. The workshop was co-sponsored by McDonnell Douglas Space Systems Company and NASA Ames Research Center. Proceedings of the workshop are presented. For individual titles, see N93-31440 through N93-31458.

N93-31440*# National Aeronautics and Space Administration, Washington, DC.

FUZZY CONTROL/SPACE STATION AUTOMATION

Mark Gersh *In* McDonnell-Douglas Space Systems Co., Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 7-27 (For primary document see N93-31439 12-18)
Avail: CASI HC A03/MF A04

Viewgraphs on fuzzy control/space station automation are presented. Topics covered include: Space Station Freedom (SSF); SSF evolution; factors pointing to automation & robotics (A&R); astronaut office inputs concerning A&R; flight system automation and ground operations applications; transition definition program; and advanced automation software tools. CASI

N93-31441*# Togai InfraLogic, Inc., Irvine, CA.

COMMERCIAL APPLICATIONS **c67**

Masaki Togai *In* McDonnell-Douglas Space Systems Co., Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 29-64 (For primary document see N93-31439 12-18)
Avail: CASI HC A03/MF A04

Viewgraphs on commercial applications of fuzzy logic in Japan are presented. Topics covered include: suitable application area of fuzzy theory; characteristics of fuzzy control; fuzzy closed-loop controller; Mitsubishi heavy air conditioner; predictive fuzzy control; the Sendai subway system; automatic transmission; fuzzy logic-based command system for antilock braking system; fuzzy feed-forward controller; and fuzzy auto-tuning system. CASI

N93-31442*# Tokyo Inst. of Tech. (Japan).

CURRENT PROJECTS IN FUZZY CONTROL **c67**

Michio Sugeno *In* McDonnell-Douglas Space Systems Co., Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 65-77 (For primary document see N93-31439 12-18)
Avail: CASI HC A03/MF A04

Viewgraphs on current projects in fuzzy control are presented. Three projects on helicopter flight control are discussed. The projects are (1) radio control by oral instructions; (2) automatic autorotation entry in engine failure; and (3) unmanned helicopter for sea rescue. CASI

N93-31443*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

TERMINOLOGY AND CONCEPTS OF CONTROL AND FUZZY LOGIC **c67**

Jack Aldridge (McDonnell-Douglas Space Systems Co., Houston, TX.), Robert Lea, Yashvant Jani (LinCom Corp., Houston, TX.), and Jonathan Weiss (McDonnell-Douglas Space Systems Co., Houston, TX.) *In* McDonnell-Douglas Space Systems Co., Workshop on Fuzzy Control Systems and Space Station Applications 79-98 (SEE N93-31439 12-18) Nov. 1990 (For primary document see N93-31439 12-18)
Avail: CASI HC A03/MF A04

Viewgraphs on terminology and concepts of control and fuzzy logic are presented. Topics covered include: control systems; issues in the design of a control system; state space control for inverted pendulum; proportional-integral-derivative (PID) controller; fuzzy controller; and fuzzy rule processing. CASI

N93-31444*# Sterling Federal Systems, Inc., Moffett Field, CA.

NASA/ARC PROPOSED TRAINING IN INTELLIGENT CONTROL **c63**

Hamid R. Berenji *In* McDonnell-Douglas Space Systems Co., Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 99-107 (For primary document see N93-31439 12-18)
Avail: CASI HC A02/MF A04

Viewgraphs on NASA Ames Research Center proposed training in intelligent control was presented. Topics covered include: fuzzy logic control; neural networks in control; artificial intelligence in control; hybrid approaches; hands on experience; and fuzzy controllers. CASI

N93-31445*# APT, Inc., San Diego, CA.

OVERVIEW OF FUZZY LOGIC **c67**

Xiwen Ma *In* McDonnell-Douglas Space Systems Co., Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 109-126 (For primary document see N93-31439 12-18)
Avail: CASI HC A03/MF A04

Viewgraphs on an overview of fuzzy logic are presented. Topics covered include: fuzzy control system; fuzzy logic; fuzzy inference; fuzzy controller; and the Sendai subway system. CASI

N93-31446*# University of Southern California, Los Angeles.
INTRODUCTION TO FUZZY SET THEORY **c67**
Bart Kosko *In* McDonnell-Douglas Space Systems Co., Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 127-320 (For primary document see N93-31439 12-18)
Avail: CASI HC A09/MF A04

An introduction to fuzzy set theory is described. Topics covered include: neural networks and fuzzy systems; the dynamical systems approach to machine intelligence; intelligent behavior as adaptive model-free estimation; fuzziness versus probability; fuzzy sets; the entropy-subsethood theorem; adaptive fuzzy systems for backing up a truck-and-trailer; product-space clustering with differential competitive learning; and adaptive fuzzy system for target tracking. CASI

N93-31447*# McDonnell-Douglas Space Systems Co., Huntington Beach, CA.
SPACE STATION FREEDOM ATTITUDE DETERMINATION AND CONTROL SYSTEM OVERVIEW
Jeff Penrod *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 321-332 (For primary document see N93-31439 12-18)
Avail: CASI HC A03/MF A04

Viewgraphs on Space Station Freedom attitude determination and control system overview are presented. Topics covered include: highly dynamic plant; SSF flight attitudes; effectors; inertial attitude sensors; control system performance requirements; control system functional requirements; and controller architecture. CASI

N93-31448*# McDonnell-Douglas Space Systems Co., Huntington Beach, CA.
BLOWDOWN THRUST PROFILE PREDICTION
Kelly D. Murdock *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 333-346 (For primary document see N93-31439 12-18)
Avail: CASI HC A03/MF A04

Viewgraphs on blowdown thrust profile prediction are presented. Topics covered include: Space Station Freedom propulsion system; blowdown hydrazine system; thruster cycling; attitude control; and fuzzy logic control. CASI

N93-31449*# McDonnell-Douglas Space Systems Co., Houston, TX.
PROXIMITY OPERATIONS IN SPACE STATION ENVIRONMENT
Brandt Rhodes *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 347-355 (For primary document see N93-31439 12-18)
Avail: CASI HC A02/MF A04

Viewgraphs on proximity operations in space station environment are presented. Topics covered include: automated flight; remote manual piloting; task requirements and constraints; problem formulation; and flight parameter flow/pilot interaction for proximity operations task. CASI

N93-31450*# McDonnell-Douglas Space Systems Co., Houston, TX.
RENDEZVOUS GUIDANCE
Andrew T. McGuire *In its* Workshop on Fuzzy Control Systems and Space Systems Applications Nov. 1990 p 357-365 (For primary document see N93-31439 12-18)
Avail: CASI HC A02/MF A04

Viewgraphs on rendezvous guidance are presented. Topics covered include: rendezvous guidance; Lambert Targeting; Linear Quadratic Targeting; unmanned vehicles; rendezvous trajectory; and fuzzy logic control. CASI

N93-31451*# McDonnell-Douglas Space Systems Co., Cocoa Beach, FL.
PATH PLANNING CONTROL **c12**
Malcolm McRoberts *In its* Workshop on Fuzzy Control Systems and Space Station Applicatons Nov. 1990 p 367-372 (For primary document see N93-31439 12-18)
Avail: CASI HC A02/MF A04

Viewgraphs on path planning control are presented. Topics covered include: model based path planning; sensor based path planning; hybrid path planning; proximity sensor array; and applications for fuzzy logic. CASI

N93-31452*# McDonnell-Douglas Space Systems Co., Houston, TX.
ACTIVE DAMPING IN A FLEXIBLE MANIPULATOR **c37**
Trung T. Pham *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 373-381 (For primary document see N93-31439 12-18)
Avail: CASI HC A02/MF A04

Viewgraphs on active damping in a flexible manipulator are presented. Topics covered include: Shuttle Remote Manipulator System (SRMS); flexible structures; vibration; modeling of a flexible manipulator dynamical structure; designing control law criterion that minimizes vibration; and candidate application of fuzzy logic control law to the problem. CASI

N93-31453*# McDonnell-Douglas Space Systems Co., Houston, TX.
TETHERED SYSTEMS CONTROL
Dan Nowlan *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 382-390 (For primary document see N93-31439 12-18)
Avail: CASI HC A02/MF A04

Viewgraphs on tethered systems control are presented. Topics covered include: rigid body simplifications; feedback control; quadratic optimal nonlinear control; quadratic optimal nonlinear controllers; Lyapunov-based nonlinear controllers; sensor/actuator options; tether control; and fuzzy logic control. CASI

N93-31454*# McDonnell-Douglas Space Systems Co., Houston, TX.
HYPERBARIC TREATMENT **c52**
Michael T. Amoroso *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 391-411 (For primary document see N93-31439 12-18)
Avail: CASI HC A03/MF A04

Viewgraphs on hyperbaric treatment are presented. Topics covered include: hyperbaric treatment - purpose; decompression sickness; sources of decompression sickness; physical description; forms of decompression sickness; hyperbaric treatment of decompression sickness; and duration of treatment. CASI

N93-31455*# McDonnell-Douglas Space Systems Co., Houston, TX.
DAILY EXERCISE ROUTINES **c52**
Patrick L. Anderson and Michael T. Amoroso *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 413-418 (For primary document see N93-31439 12-18)
Avail: CASI HC A02/MF A04

Viewgraphs on daily exercise routines are presented. Topics covered include: daily exercise and periodic stress testings; exercise equipment; physiological monitors; exercise protocols; physiological levels; equipment control; control systems; and fuzzy logic control. CASI

N93-31456*# McDonnell-Douglas Space Systems Co., Huntington Beach, CA.
ATMOSPHERIC CONTROL SYSTEMS **c54**
Melanie Mankamyer *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 419-425 (For primary document see N93-31439 12-18)
Avail: CASI HC A02/MF A04

Viewgraphs on atmospheric control systems are presented. Techniques to maintain atmospheric control parameters are identified. Fuzzy logic control law is mentioned for application to atmospheric control. CASI

N93-31457*# McDonnell-Douglas Space Systems Co., Huntington Beach, CA.
ROTATIONAL SPEED CONTROL **c54**
Paul Bastin *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 427-434 (For primary document see N93-31439 12-18)
Avail: CASI HC A02/MF A04

Viewgraphs on rotational speed control are presented. The Centrifuge Facility Systems Study - 2.5 m centrifuge is shown. A life sciences centrifuge is scheduled to fly aboard Space Station Freedom. Live animal and plant specimens will be carried on the rotor and compared with microgravity specimens in racks. CASI

N93-31458*# McDonnell-Douglas Space Systems Co., Huntington Beach, CA.
VIBRATION ISOLATION **c54**
Paul Bastin *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 435-443 (For primary document see N93-31439 12-18)
Avail: CASI HC A02/MF A04

Viewgraphs on vibration isolation are presented. Techniques to control and isolate centrifuge disturbances were identified. Topics covered include: disturbance sources in the microgravity environment; microgravity assessment criteria; life sciences centrifuge; flight support equipment for launch; active vibration isolation system; active balancing system; and fuzzy logic control. CASI

N93-32061# Naval Postgraduate School, Monterey, CA.
PETITE AMATEUR NAVAL SATELLITE SPACECRAFT DIGITAL CONTROL SYSTEM: A HARDWARE DESIGN M.S. Thesis
John D. Ashe Mar. 1993 120 p
(AD-A265234) Avail: CASI HC A06/MF A02

This thesis provides the foundational hardware design for the Digital Control System of the Petite Amateur Navy Satellite (PANSAT). The design implements a multitasking operating system to provide store and forward communications. This design contains 'pair and a spare' technology to provide redundancy for space operations. Addresses necessary for software design are discussed and examples of initializing commands for the more complex sections are given. CMOS technology was used throughout the design to minimize the power requirements. RS422 protocol was used on all communications lines to lessen the impact of noise. The MSOC 186 microprocessor coupled with an 82C55 Programmable Peripheral Interface are the cornerstone of the design. All peripheral sections, Telemetry, Memory, and Communications are designed to be controlled by the M80CI86 vis the 82C55. Since the mission of PANSAT may be changed slightly before the launch of the vehicle, the hardware design contained in this document is engineered to be upwardly compatible where possible. DTIC

N93-32228*# Draper (Charles Stark) Lab., Inc., Cambridge, MA.
FUZZY BASED ATTITUDE CONTROLLER FOR FLEXIBLE SPACECRAFT WITH ON/OFF THRUSTERS M.S. Thesis - M.I.T., 1993
Roger Glenn Knapp May 1993 135 p
(Contract NAS9-18426)
(NASA-CR-188250; NAS 1.26:188250; CSDL-T-1183) Avail: CASI HC A07/MF A02

A fuzzy-based attitude controller is designed for attitude control of a generic spacecraft with on/off thrusters. The controller is comprised of packages of rules dedicated to addressing different objectives (e.g., disturbance rejection, low fuel consumption, avoiding the excitation of flexible appendages, etc.). These rule packages can be inserted or removed depending on the requirements of the particular spacecraft and are parameterized based on vehicle parameters such as inertia or operational parameters such as the maneuvering rate. Individual rule packages can be 'weighted' relative to each other to emphasize the importance of one objective relative to another. Finally, the fuzzy controller and rule packages are demonstrated using the high-fidelity Space Shuttle Interactive On-Orbit Simulator (IOS) while performing typical on-orbit operations and are subsequently compared with the existing shuttle flight control system performance. Author

N93-32335# Naval Postgraduate School, Monterey, CA. Dept. of Mathematics.
SATELLITE MOTION AROUND AN OBLATE PLANET: A PERTURBATION SOLUTION FOR ALL ORBITAL PARAMETERS Technical Report, Jan. - Apr. 1993
D. A. Danielson, G. E. Latta, C. P. Sagovac, S. D. Krambeck, and J. R. Snider 6 May 1993 24 p
(AD-A265779; NPS-MA-93-018) Avail: CASI HC A03/MF A01

The search for a universal solution of the equations of motion for a satellite orbiting an oblate planet is a subject that has merited great interest because of its theoretical and practical implications. Here, a complete first-order perturbation solution, including the effects of the J2 terms in the planet's potential, is given in terms of standard orbital parameters. The simple formulas provide a fast method for predicting satellite orbits that is more accurate than the two-body formulas. These predictions are shown to agree well with those of a completely numerical code and with actual satellite data. Also, in an appendix, it is rigorously proven that a satellite having negative mechanical energy remains for all time within a spherical annulus with radii approximately equal to the perigee and apogee of its initial osculating ellipse. DTIC

N93-32381*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
VARIATIONAL TRAJECTORY OPTIMIZATION TOOL SET: TECHNICAL DESCRIPTION AND USER'S MANUAL
Robert R. Bless (Lockheed Engineering and Sciences Co., Hampton, VA.), Eric M. Queen, Michael D. Cavanaugh (George Washington Univ., Hampton, VA.), Todd A. Wetzel (Iowa State Univ. of Science and Technology, Ames.), and Daniel D. Moerder Washington Jul. 1993 59 p
(RTOP 946-01-00-82)
(NASA-TM-4442; L-17166; NAS 1.15:4442) Avail: CASI HC A04/MF A01

The algorithms that comprise the Variational Trajectory Optimization Tool Set (VTOTS) package are briefly described. The VTOTS is a software package for solving nonlinear constrained optimal control problems from a wide range of engineering and scientific disciplines. The VTOTS package was specifically designed to minimize the amount of user programming; in fact, for problems that may be expressed in terms of analytical functions, the user needs only to define the problem in terms of symbolic variables. This version of the VTOTS does not support tabular data; thus, problems must be expressed in terms of analytical functions. The VTOTS package consists of two methods for solving nonlinear optimal control problems: a time-domain finite-element algorithm and a multiple shooting algorithm. These two algorithms, under the VTOTS package, may be run independently or jointly. The finite-element algorithm generates approximate solutions, whereas the shooting algorithm provides a more accurate solution to the optimization problem. A user's manual, some examples with results, and a brief description of the individual subroutines are included. Author (revised)

N93-32102*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
AUTOMATED ASSEMBLY OF LARGE SPACE STRUCTURES USING AN EXPERT SYSTEM EXECUTIVE
Cheryl L. Allen *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 43-53 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

N93-32103*# Stanford Univ., CA. Aerospace Robotics Lab.
STANFORD AEROSPACE RESEARCH LABORATORY RESEARCH OVERVIEW
W. L. Ballhaus, L. J. Alder, V. W. Chen, W. C. Dickson, and M. A. Ullman *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 54-65 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

N93-32111*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SATELLITE TEST ASSISTANT ROBOT (STAR)
D. A. McAffee, D. J. Kerrisk, and K. R. Johnson *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 131-148 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

N93-32118*# Maryland Univ., College Park. Space Systems Lab.
POTENTIAL ROLES FOR EVA AND TELEROBOTICS IN A UNIFIED WORKSITE Abstract only
David Akin and Russel D. Howard *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 181 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

N93-32121*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
JSC FLIGHT EXPERIMENT RECOMMENDATION IN SUPPORT OF SPACE STATION ROBOTIC OPERATIONS
Reginald B. Berka *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 191-20 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

N93-32124*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
AN OVERVIEW OF THE KENNEDY SPACE CENTER ROBOTICS PROGRAM
Eric L. Rhodes *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 213-22 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N93-31040*# AOTF Technology, Inc., Sunnyvale, CA.
AOTF ENHANCEMENTS FOR A SPACE-BASED SPECTROPOLARIMETER
5 Jul. 1993 47 p
(Contract NAS7-1052)
(NASA-CR-193290; NAS 1.26:193290) Avail: CASI HC A03/MF A01

Progress in the development of enhancements to acousto-optical tunable filters (AOTF) is summarized. Specific topics addressed include extended tuning range, AOTF efficiency enhancement, anti-reflection coating, new materials, bandpass modification, RF synthesizer, device confinement and aging, resonance enhanced AOTF, and the development of an AOTF spectropolarimeter. CASI

N93-31048# Tuebingen Univ. (Germany). Astronomisches Inst.
CALIBRATION OF ORFEUS ECHELLE SPECTROMETER Thesis [KALIBRATION DES ORFEUS ECHELLE-SPEKTROMETERS]
Michael Goelz May 1992 134 p In GERMAN
(ETN-93-94201) Avail: CASI HC A07/MF A02

A basis is created for spectrophotometric calibration of ORFEUS (Orbiting and Retrieval Far and Extreme Ultraviolet Spectrometer) in Earth orbit. The ORFEUS telescope is onboard ASTRO-SPAS (Shuttle Pallet Satellite) for observing cool and hot stars, active galactic nuclei, and interstellar medium. ORFEUS spectrometer calibration before and after the flight is described. Standard stars which are used for instrument sensitivity and calibration are presented and discussed. Standard stars used for International Ultraviolet Explorer and Hopkins Ultraviolet Telescope are shown to be particularly important. The following aspects, which must be considered in ORFEUS calibration, were discussed: maximal counting rates, standard star systems quality, atmosphere modeling possibilities, observability, acquisition, pointing, and spectra with few lines. These characteristics were used for discussing possible utilization of numerous reference stars which were described in terms of effective temperature, chemical composition, and interstellar reddening. G191 BLB white dwarf star is shown to have the best properties for ORFEUS calibration. ESA

N93-31787# College de France, Paris.
A CONCEPT OF DEPLOYABLE TETHERED INTERFEROMETER
P. Claudin and A. Labeyrie *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 241-245 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31788# College de France, Paris.
INTERFEROMETER CONCEPTS FOR ASTROMETRY IN SPACE
Antoine Labeyrie *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 247-250 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxilliary power sources.

For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 44 Energy Production and Conversion,* and *15 Launch Vehicles and Space Vehicles.*

N93-31168# Westinghouse Hanford Co., Richland, WA.
THULIUM HEAT SOURCES FOR SPACE POWER APPLICATION
C. J. Alderman Oct. 1992 9 p Presented at the 10th Symposium on Space Nuclear Power and Propulsion, Albuquerque, NM, 10-14 Jan. 1993
(Contract DE-AC06-87RL-10930)
(DE93-002249; WHC-SA-1586; CONF-930103-14) Avail: CASI HC A02/MF A01 (US Sales Only)

Reliable electrical power supplies for use in transportation and remote systems will be an important part of space exploration activities on planet surfaces. A potential power source is available through the use of thulium, a rare earth metal. Heat sources can be produced by neutron activation of naturally occurring thulium (Tm-169) targets in the base station nuclear power reactor. The resulting Tm-170 heat sources can be used in thermoelectric generators to power instrumentation and telecommunications systems located at remote sites. Combined with a dynamic Sterling or Brayton cycle conversion system, the heat source can power a lightweight electrical source for rovers or other surface transportation systems. DOE

N93-31185# Los Alamos National Lab., NM.
THE THERMIONIC FUEL ELEMENT VERIFICATION PROGRAM: TECHNICAL PROGRESS AND FUTURE PLANS
M. G. Houts, L. L. Begg (General Atomic Co., San Diego, CA.), W. R. Wharton, Jr. (Department of Energy, Germantown, MD.), and L. Lawrence Oct. 1992 12 p Presented at the 10th Symposium on Space Nuclear Power and Propulsion, Albuquerque, NM, 10-14 Jan. 1993
(Contract W-7405-eng-36)
(DE93-003797; LA-UR-92-3618; CONF-930103-15) Avail: CASI HC A03/MF A01 (US Sales Only)

The goal of the Thermionic Fuel Element Verification Program (MVP) is to demonstrate the technological readiness of a Thermionic Fuel Element (TFE) suitable for use as the basic element in a thermionic reactor having an electric power output in the 0.5- to 5-MWe range and a full-power life of seven years. The TFEVP has made significant progress in developing components capable of withstanding the required neutron fluence (4 x 10(exp 22) n/sq cm, Eis greater than 0.1 MeV) and the required burnup (5.3%). Technology developed under the TMVP also supports the 5- to 40-kWe thermionic systems currently of interest to the Strategic Defense Initiative Organization and the United States Air Force. The fast-neutron flux in certain 5- to 40-kWe systems is up to a factor of five less than that in 0.5- to 5-MWe systems. Component technology that was developed for 0.5- to 5-MWe systems will thus be suitable for use in long-life, high-performance, 5- to 40-kWe systems. Components that are being developed by the TFEVP include insulator seals, sheath insulators, fueled emitters, cesium reservoirs, and interconnective TFE components. In addition, the TFEVP created a preliminary 2-MWe-system design and is presently evaluating converter performance under various conditions. Prototypic TFE's are also being tested. The IMVP encountered and surmounted problems in developing and testing long-life TFES. The emphasis of the U.S. thermionic reactor development effort is shifting to the development of a 40-kWe thermionic space nuclear power supply. The TFEVP will be closed out by the end of fiscal year 1994, with the close-out optimized for yielding the maximum overall program benefit-to-cost ratio. Information gained during the close-out will be very useful to the development of the 40-kWe thermionic system. DOE

N93-31188# Busek (J.) Co., Inc., Needham, MA.
A HIGH THRUST DENSITY, C60 CLUSTER, ION THRUSTER Final Report, 1 Jul. 1992 - 31 Dec. 1992
V. J. Hruby 28 Feb. 1993 84 p

(Contract F49620-92-C-0039)
(AD-A264405; BCI-029-1; AFOSR-93-0221TR) Avail: CASI HC A05/MF A01

A C60 fullerene ion thruster represents a major advance in the evolution of electrostatic propulsion. It could provide up to a factor of 30 increase in thrust density over the Xe thruster as well as simultaneous reduction of relative losses by a factor of 5.5. Its basic feasibility has been experimentally verified during the Phase 1 program. Vaporization and discharge chambers as well as simple acceleration grid were designed and constructed. A set of unique experiments were performed which demonstrated: (1) controllable fullerene vapor generation, (2) stable discharge at approximately 190 volts using 2% thoriated tungsten cathode filament, (3) fullerene acceleration with beam ion energy cost of about 900 to 1000 eV/beam ion at a mass utilization of 70%, (4) no detectable fullerene fragmentation due to vaporization, ionization and acceleration, (5) fullerenes in a highly diffused molecular beam were not detected by FTIR spectroscopy, (6) SST, Mo, BN, AlN, Al2O3, and quartz do not react with fullerene vapor during limited exposure, and (7) spacecraft contamination by fullerene thruster effluent is comparable to that predicted for lithium. Methods to reduce it were identified. DTIC

N93-31291# Phillips Lab., Edwards AFB, CA.
APPLICATION OF THE SAHA EQUATION TO HIGH TEMPERATURE (GREATER THAN OR EQUAL TO 6000 K) ROCKET EXHAUST Final Report
Robert T. Nachtrieb Mar. 1993 164 p
(AF Proj. 3058)
(AD-A264004; PL-TR-92-3042R) Avail: CASI HC A08/MF A02

Using the SAHA equations and spectroscopic constants, the computer program calculates the species populations of diatomic molecules, neutrals, ions, and electrons in a plasma. The code considers the equilibrium of a two-element, chemically reacting plasma, by calculating the partition function for each species. By rederiving theoretically, as the JANNAF tables do, the thermodynamic properties of a rocket propellant, but using extended excitation levels, the program can estimate (above 6000 K) performance of advanced propulsion concepts. This second edition code described considers in addition to mixtures of carbon (C), hydrogen (H), nitrogen (N), and oxygen (O), the species of argon (Ar), up through C(sub V), H(sub II), N(sub IV), O(sub V), and Ar(sub V); any diatomic combination of these elements, both neutral and singly ionized. The user can enter in spectroscopic data for his own elements. Program results agree with JANNAF tables at 6000 K, for dominant species; output graphs of nitrogen species densities (3000 K to 30,000 K) and air species mole fractions (3000 K to 10,000 K) match published data. The second edition also has the additional feature of being able to calculate rocket performance based upon the input of a specific quantity of energy when running the code. This is especially valuable for calculating the high temperature performance of laser, fusion, and antiproton thermal propulsion systems which add heat to a working fluid or propellant. DTIC

N93-31295*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
REUSABLE CRYOGENIC LIQUID ROCKET PROPELLANT TANK Patent Application
William T. Freeman, inventor (to NASA), Ian O. MacConochie, inventor (to NASA), Charles A. Breiner, inventor (to NASA), and Charles F. Bryan, Jr., inventor (to NASA) 12 Jul. 1993 11 p
(NASA-Case-LAR-14172-1; NAS 1.71:LAR-14172-1;
US-Patent-Appl-SN-090838) Avail: CASI HC A03/MF A01

A reusable liquid rocket propellant tank is provided. The tank consists of a composite outer shell, a foam-filled honeycomb sandwich insulation layer bonded to the inner surface of the composite shell and a collapsible inner lining which may be removed from the outer shell for inspection and replacement. NASA

N93-31310*# National Aeronautics and Space Administration, Washington, DC.
INERTIAL ELECTROSTATIC CONFINEMENT AS A POWER SOURCE FOR ELECTRIC PROPULSION
G. H. Miley (Illinois Univ., Urbana.), R. Burton (Illinois Univ., Urbana.), J. Javedani (Illinois Univ., Urbana.), Y. Yamamoto (Illinois Univ., Urbana.), A Satsangi (Illinois Univ., Urbana.), Y. Gu (Illinois Univ., Urbana.), P. Heck (Illinois Univ., Urbana.), R. Nebel (Los Alamos National Lab., NM.), N. Schulze, and J. Christensen (Illinois Univ., Urbana.) et al 31 Mar. 1993 14 p Presented at the Vision 21 Conference, Cleveland, OH, 30-31 Mar. 1993 Submitted for publication
(NASA-TM-109228; NAS 1.15:109228; FSL-422) Avail: CASI HC A03/MF A01

The potential use of an INERTIAL ELECTROSTATIC CONFINEMENT (IEC) power source for space propulsion has previously been suggested by the authors and others. In the past, these discussions have generally followed the charged-particle electric-discharge engine (QED) concept proposed by Bussard, in which the IEC is used to generate an electron beam which vaporizes liquid hydrogen for use as a propellant. However, an alternate approach is considered, using the IEC to drive a 'conventional' electric thruster unit. This has the advantage of building on the rapidly developing technology for such thrusters, which operate at higher specific impulse. Key issues related to this approach include the continued successful development of the physics and engineering of the IEC unit, as well as the development of efficient step-down dc voltage transformers. The IEC operates by radial injection of energetic ions into a spherical vessel. A very high ion density is created in a small core region at the center of the vessel, resulting in extremely high fusion power density in the core. Experiments at the U. of Illinois in small IEC devices (is less than 60 cm. dia.) demonstrated much of the basic physics underlying this concept, e.g. producing 10(exp 6) D-D neutrons/sec steady-state with deuterium gas flow injection. The ultimate goal is to increase the power densities by several orders of magnitude and to convert to D-He-3 injection. If successful, such an experiment would represent a milestone proof-of-principle device for eventual space power use. Further discussion of IEC physics and status are presented with a description of the overall propulsion system and estimated performance. Author (revised)

N93-31552*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
STRUCTURAL INTEGRITY AND DURABILITY OF REUSABLE SPACE PROPULSION SYSTEMS
May 1991 288 p Conference held in Cleveland, OH, 14-15 May 1991
(RTOP 553-13-00)
(NASA-CP-10064; E-6068; NAS 1.55:10064) Avail: CASI HC A13/MF A03

A two-day conference on the structural integrity and durability of reusable space propulsion systems was held on 14 to 15 May 1991 at the NASA Lewis Research Center. Presentations were made by industry, university, and government researchers organized into four sessions: (1) aerothermodynamic loads; (2) instrumentation; (3) fatigue, fracture, and constitutive modeling; and (4) structural dynamics. The principle objectives were to disseminate research results and future plans in each of four areas. This publication contains extended abstracts and the visual material presented during the conference. Particular emphasis is placed on the Space Shuttle Main Engine (SSME) and the SSME turbopump. For individual titles, see N93-31553 through N93-31588.

N93-31553*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
PROGRESS IN THE MEASUREMENT OF SSME TURBINE HEAT FLUX WITH PLUG-TYPE SENSORS **c35**
Curt H. Liebert *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 3-7 (For primary document see N93-31552 12-20)
Avail: CASI HC A01/MF A03

Data reduction was completed for tests of plug-type heat flux sensors (gauges) in a turbine blade thermal cycling tester (TBT) that is located at NASA/Marshall Space Flight Center, and a typical gauge is illustrated. This is the first time that heat flux has been measured in a Space Shuttle Main Engine (SSME) Turbopump Turbine environment. The development of the concept for the gauge was performed in a heat flux measurement facility at Lewis. In this facility, transient and steady state absorbed surface heat flux information was obtained from transient temperature measurements taken at points within the gauge. A schematic of the TBT is presented, and plots of the absorbed surface heat flux measured on the three blades tested in the TBT are presented. High quality heat flux values were measured on all three blades. The experiments demonstrated that reliable and durable gauges can be repeatedly fabricated into the airfoils. The experiment heat

flux data are being used for verification of SSME analytical stress, boundary layer, and heat transfer design models. Other experimental results and future plans are also presented. Derived from text

N93-31554*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

THIN FILM HEAT FLUX SENSOR FOR SPACE SHUTTLE MAIN ENGINE TURBINE ENVIRONMENT **c35**

Herbert Will *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 9-13 (For primary document see N93-31552 12-20)

Avail: CASI HC A01/MF A03

The Space Shuttle Main Engine (SSME) turbine environment stresses engine components to their design limits and beyond. The extremely high temperatures and rapid temperature cycling can easily cause parts to fail if they are not properly designed. Thin film heat flux sensors can provide heat loading information with almost no disturbance of gas flows or of the blade. These sensors can provide steady state and transient heat flux information. A thin film heat flux sensor is described which makes it easier to measure small temperature differences across very thin insulating layers. Derived from text

N93-31555*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

THIN FILM THERMOCOUPLES FOR HIGH TEMPERATURE TURBINE APPLICATION **c35**

Lisa C. Martin *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 15-20 (For primary document see N93-31552 12-20)

Avail: CASI HC A02/MF A03

The objective is to develop thin film thermocouples (TFTC) for Space Shuttle Main Engine (SSME) components such as the high pressure fuel turbopump (HPFTP) blades and to test TFTC survivability and durability in the SSME environment. The purpose for developing TFTC's for SSME components is to obtain blade temperatures for computational models developed for fluid mechanics and structures. The TFTC must be able to withstand the presence of high temperature, high pressure hydrogen as well as a severe thermal transient due to a cryogenic to combustion temperature change. The TFTC's will eventually be installed and tested on SSME propulsion system components in the SSME test bed engine. The TFTC's were successfully fabricated on flat coupons of MAR-M 246 (Hf+), which is the superalloy material used for HPFTP turbine blades. The TFTC's fabricated on flat coupons survived thermal shock cycling as well as testing in a heat flux measurement facility which provided a rapid thermal transient. The same fabrication procedure was used to deposit TFTC's on HPFTP first stage rotor blades. Other results from the experiments are presented, and future testing plans are discussed. Derived from text

N93-31556*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

RAYLEIGH-BRILLOUIN SCATTERING FOR HIGH-PRESSURE GAS TEMPERATURE MEASUREMENTS **c36**

Richard G. Seasholtz *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 21-27 (For primary document see N93-31552 12-20)

Avail: CASI HC A02/MF A03

An experiment was set up to evaluate the feasibility of using Rayleigh-Brillouin scattering as a diagnostic technique for measuring gas temperature in high pressure environments, such as the Space Shuttle Main Engine (SSME) Preburner. A high pressure furnace is used as the scattering chamber. Either nitrogen or hydrogen may be used. An argon ion laser beam is focused into the furnace. Light backscattering from the gas in the furnace is collected and analyzed with a 5-pass scanning Fabry-Perot interferometer and photon counting electronics. The multi-pass configuration provides the high frequency selectively needed to measure the Brillouin peaks in the presence of large amounts of spuriously scattered light at the laser frequency. Preliminary measurements were made at room temperature in nitrogen at pressures up to 2000 psia. The free spectral range of the interferometer and frequency separation of the Brillouin peaks are determined from measured spectra. Temperature measurements are then obtained using the simple continuum theory with low frequency values of specific heat ratio and shear viscosity. The measured temperatures are within 10 percent of the true value. Derived from text

N93-31557*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

NEURAL NETS FOR ALIGNING OPTICAL COMPONENTS IN HARSH ENVIRONMENTS: BEAM SMOOTHING SPATIAL FILTER AS AN EXAMPLE **c63**

Arthur J. Decker and Michael J. Krasowski *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 29-38 (For primary document see N93-31552 12-20)

Avail: CASI HC A02/MF A03

The goal is to develop an approach to automating the alignment and adjustment of optical measurement, visualization, inspection, and control systems. Classical controls, expert systems, and neural networks are three approaches to automating the alignment of an optical system. Neural networks were chosen for this project and the judgements that led to this decision are presented. Neural networks were used to automate the alignment of the ubiquitous laser-beam-smoothing spatial filter. The results and future plans of the project are presented. Derived from text

N93-31558*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

PROGRESS IN SPECKLE-SHIFT STRAIN MEASUREMENT **c39**

Christian T. Lant (Sverdrup Technology, Inc., Brook Park, OH.), John P. Barranger, Lawrence G. Oberle, and Lawrence C. Greer, III *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 39-44 (For primary document see N93-31552 12-20)

Avail: CASI HC A02/MF A03

The Instrumentation and Control Technology Division of the Lewis Research Center has been developing an in-house capability to make one dimensional and two dimensional optical strain measurements on high temperature test specimens. The measurements are based on a two-beam speckle-shift technique. The development of composite materials for use in high temperature applications is generating interest in using the speckle-shift technique to measure strains on small diameter fibers and wires of various compositions. The results of preliminary speckle correlation tests on wire and fiber specimens are covered, and the advanced system currently under development is described. Derived from text

N93-31559*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

OPAD 1991 Status Report

W. T. Powers and A. E. Cooper *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 45-49 (For primary document see N93-31552 12-20)

Avail: CASI HC A01/MF A03

The Optical Plume Anomaly Detection Program, an experimental study in the attempt to create a rocket engine health monitor based on detection and possible quantification of anomalous atomic and molecular species in the exhaust plume, has been in existence for several years. The instruments developed to monitor the exhaust plumes are presented. Two optical instruments are employed: the polychromator and the spectrometer. The polychromator is a 16 channel spectroradiometer having independent channels individually adjustable for center wavelength and pass bandwidth. Those values may be mechanically reset, with the aid of certain lab equipment. The spectrometer is a multichannel spectral analyzer having two 2048 element linear photodiode arrays at the exit plane of the dispersing instrument, which, like the 16 channel device, is a 1/2 meter grating spectrograph. These instruments are equipped with ultraviolet grade multifiber optical input cables, allowing the instruments to be placed in a benign environment. Telescopes mounted on the test stand observe the plume keeping the shock structure in view. The data acquisition and control system consist of four 80386-33 MHz computers: two at the test stand for instrument control and data preconditioning, and two in the test support building providing data archiving, display, and system control. Further descriptions of the instrumentation are provided. Derived from text

N93-31560*# Cincinnati Univ., OH.

AN INTEGRATED EDDY CURRENT DETECTION AND IMAGING SYSTEM ON A SILICON CHIP **c76**

H. Thurman Henderson, K. P. Kartalia, and Joseph D. Dury *In* NASA.

Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 51-61 (For primary document see N93-31552 12-20)
Avail: CASI HC A03/MF A03

Eddy current probes have been used for many years for numerous sensing applications including crack detection in metals. However, these applications have traditionally used the eddy current effect in the form of a physically wound single or different probe pairs which of necessity must be made quite large compared to microelectronics dimensions. Also, the traditional wound probe can only take a point reading, although that point might include tens of individual cracks or crack arrays; thus, conventional eddy current probes are beset by two major problems: (1) no detailed information can be obtained about the crack or crack array; and (2) for applications such as quality assurance, a vast amount of time must be taken to scan a complete surface. Laboratory efforts have been made to fabricate linear arrays of single turn probes in a thick film format on a ceramic substrate as well as in a flexible cable format; however, such efforts inherently suffer from relatively large size requirements as well as sensitivity issues. Preliminary efforts to fully extend eddy current probing from a point or single dimensional level to a two dimensional micro-eddy current format on a silicon chip, which might overcome all of the above problems, are presented. Derived from text

N93-31561*# Cincinnati Univ., OH.
FOUR DIMENSIONAL RECONSTRUCTION AND ANALYSIS OF PLUME IMAGES Abstract Only
Atam P. Dhawan, Charles Peck, III, and Peter Disimile *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 63 (For primary document see N93-31552 12-20)
Avail: CASI HC A01/MF A03

A number of methods have been investigated and are under current investigation for monitoring the health of the Space Shuttle Main Engine (SSME). Plume emission analysis has recently emerged as a potential technique for correlating the emission characteristics with the health of an engine. In order to correlate the visual and spectral signatures of the plume emission with the characteristic health monitoring features of the engine, the plume emission data must be acquired, stored, and analyzed in a manner similar to flame emission spectroscopy. The characteristic visual and spectral signatures of the elements vaporized in exhaust plume along with the features related to their temperature, pressure, and velocity can be analyzed once the images of plume emission are effectively acquired, digitized, and stored on a computer. Since the emission image varies with respect to time at a specified planar location, four dimensional visual and spectral analysis need to be performed on the plume emission data. In order to achieve this objective, feasibility research was conducted to digitize, store, analyze, and visualize the images of a subsonic jet in a cross flow. The jet structure was made visible using a direct injection flow visualization technique. The results of time-history based three dimensional reconstruction of the cross sectional images corresponding to a specific planar location of the jet structure are presented. The experimental set-up to acquire such data is described and three dimensional displays of time-history based reconstructions of the jet structure are discussed. Derived from text

N93-31562*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
STRUCTURAL DYNAMICS: PROBABILISTIC STRUCTURAL ANALYSIS METHODS. PROGRAM OVERVIEW **c39**
Christos C. Chamis and Dale A. Hopkins *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 65-70 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

A brief description is provided of the fundamental aspects of a quantification process. Progress since the last structural durability conference in 1989 is summarized. The methodology to date and that to be developed during the life of the program is presented. The uncertain factors are presented. The approach is outlined that is required to achieve component and/or system certification in the shortest possible time for affordable reliability risk. Two new elements appear in a block diagram: (1) uncertainties in human factor, and (2) uncertainties in the computer code. Research to quantify the uncertainties in the human factor was initiated and is discussed. Derived from text

N93-31563*# Southwest Research Inst., San Antonio, TX.
STRUCTURAL RELIABILITY METHODS: CODE DEVELOPMENT STATUS **c38**
Harry R. Millwater, Ben H. Thacker, Y.-T. Wu, and T. A. Cruse (Vanderbilt Univ., Nashville, TN.) *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 71-75 (For primary document see N93-31552 12-20)
Avail: CASI HC A01/MF A03

The Probabilistic Structures Analysis Method (PSAM) program integrates state of the art probabilistic algorithms with structural analysis methods in order to quantify the behavior of Space Shuttle Main Engine structures subject to uncertain loadings, boundary conditions, material parameters, and geometric conditions. An advanced, efficient probabilistic structural analysis software program, NESSUS (Numerical Evaluation of Stochastic Structures Under Stress) was developed as a deliverable. NESSUS contains a number of integrated software components to perform probabilistic analysis of complex structures. A nonlinear finite element module NESSUS/FEM is used to model the structure and obtain structural sensitivities. Some of the capabilities of NESSUS/FEM are shown. A Fast Probability Integration module NESSUS/FPI estimates the probability given the structural sensitivities. A driver module, PFEM, couples the FEM and FPI. NESSUS, version 5.0, addresses component reliability, resistance, and risk. Derived from text

N93-31564*# Rockwell International Corp., Canoga Park, CA. Rocketdyne Div.
PROBABILISTIC LOAD SIMULATION: CODE DEVELOPMENT STATUS
J. F. Newell and H. Ho *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 77-84 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

The objective of the Composite Load Spectra (CLS) project is to develop generic load models to simulate the composite load spectra that are included in space propulsion system components. The probabilistic loads thus generated are part of the probabilistic design analysis (PDA) of a space propulsion system that also includes probabilistic structural analyses, reliability, and risk evaluations. Probabilistic load simulation for space propulsion systems demands sophisticated probabilistic methodology and requires large amounts of load information and engineering data. The CLS approach is to implement a knowledge based system coupled with a probabilistic load simulation module. The knowledge base manages and furnishes load information and expertise and sets up the simulation runs. The load simulation module performs the numerical computation to generate the probabilistic loads with load information supplied from the CLS knowledge base. Derived from text

N93-31565*# Rockwell International Corp., Canoga Park, CA. Rocketdyne Div.
PROBABILISTIC EVALUATION OF SSME STRUCTURAL COMPONENTS
K. R. Rajagopal, J. F. Newell, and H. Ho *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 85-95 (For primary document see N93-31552 12-20)
Avail: CASI HC A03/MF A03

The application is described of Composite Load Spectra (CLS) and Numerical Evaluation of Stochastic Structures Under Stress (NESSUS) family of computer codes to the probabilistic structural analysis of four Space Shuttle Main Engine (SSME) space propulsion system components. These components are subjected to environments that are influenced by many random variables. The applications consider a wide breadth of uncertainties encountered in practice, while simultaneously covering a wide area of structural mechanics. This has been done consistent with the primary design requirement for each component. The probabilistic application studies are discussed using finite element models that have been typically used in the past in deterministic analysis studies. Derived from text

N93-31566*# Rockwell International Corp., Canoga Park, CA. Rocketdyne Div.
ROCKETDYNE PSAM: IN-HOUSE ENHANCEMENT/APPLICATION
J. F. Newell, K. R. Rajagopal, and K. OHara *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion

Systems May 1991 p 97-104 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

The development was initiated of the Probabilistic Design Analysis (PDA) Process for rocket engines. This will enable engineers a quantitative assessment of calculated reliability during the design process. The PDA will help choose better designs, make them more robust, and help decide on critical tests to help demonstrate key reliability issues to aid in improving the confidence of the engine capabilities. Rockedyne's involvement with the Composite Loads Spectra (CLS) and Probabilistic Structural Analysis Methodology (PSAM) contracts started this effort and are key elements in the on-going developments. Internal development efforts and hardware applications complement and extend the CLS and PSAM efforts. The completion of the CLS option work and the follow-on PSAM developments will also be integral parts of this methodology. A brief summary of these efforts is presented. Derived from text

N93-31567*# Southwest Research Inst., San Antonio, TX.
COMMERCIALIZATION OF NESSUS: STATUS **c61**
Ben H. Thacker and Harry R. Millwater *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 105-110 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

A plan was initiated in 1988 to commercialize the Numerical Evaluation of Stochastic Structures Under Stress (NESSUS) probabilistic structural analysis software. The goal of the on-going commercialization effort is to begin the transfer of Probabilistic Structural Analysis Method (PSAM) developed technology into industry and to develop additional funding resources in the general area of structural reliability. The commercialization effort is summarized. The SwRI NESSUS Software System is a general purpose probabilistic finite element computer program using state of the art methods for predicting stochastic structural response due to random loads, material properties, part geometry, and boundary conditions. NESSUS can be used to assess structural reliability, to compute probability of failure, to rank the input random variables by importance, and to provide a more cost effective design than traditional methods. The goal is to develop a general probabilistic structural analysis methodology to assist in the certification of critical components in the next generation Space Shuttle Main Engine. Derived from text

N93-31568*# Vanderbilt Univ., Nashville, TN.
SYSTEM RELIABILITY AND RISK ASSESSMENT TASK GOALS AND STATUS **c38**
T. A. Cruse and S. Mahadevan *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 111-120 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

The major focus for continued development of the Numerical Evaluation of Stochastic Structures Under Stress (NESSUS) codes is in support of system testing and certification of advanced propulsion systems. Propulsion system testing has evolved over the years from tests designed to show success, to tests designed to reveal reliability issues before service use. Such test conditions as performance envelope corners, high rotor imbalance, power dwells, and overspeed tests are designed to shake out problems that can be associated with low and high cycle fatigue, creep, and stress rupture, bearing durability, and the like. Subsystem testing supports system certification by standing as an early evaluation of the same durability and reliability concerns as for the entire system. The NESSUS software system is being further developed to support the definition of rigorous subsystem and system test definition and reliability certification. The principal technical issues are outlined which are related to system reliability, including key technology issues such as failure mode synergism, sequential failure mechanisms, and fault tree definition. Derived from text

N93-31569*# Southwest Research Inst., San Antonio, TX.
PROBABILISTIC STRUCTURAL ANALYSIS ALGORITHM DEVELOPMENT FOR COMPUTATIONAL EFFICIENCY **c61**
Y.-T. Wu *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 121-130 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

The PSAM (Probabilistic Structural Analysis Methods) program is developing a probabilistic structural risk assessment capability for the SSME components. An advanced probabilistic structural analysis software system, NESSUS (Numerical Evaluation of Stochastic Structures Under Stress), is being developed as part of the PSAM effort to accurately simulate stochastic structures operating under severe random loading conditions. One of the challenges in developing the NESSUS system is the development of the probabilistic algorithms that provide both efficiency and accuracy. The main probability algorithms developed and implemented in the NESSUS system are efficient, but approximate in nature. In the last six years, the algorithms have improved very significantly. Derived from text

N93-31570*# Rockwell International Corp., Canoga Park, CA. Rocketdyne Div.
EXPERT SYSTEM DEVELOPMENT FOR PROBABILISTIC LOAD SIMULATION
H. Ho and J. F. Newell *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 131-135 (For primary document see N93-31552 12-20)
Avail: CASI HC A01/MF A03

A knowledge based system LDEXPT using the intelligent data base paradigm was developed for the Composite Load Spectra (CLS) project to simulate the probabilistic loads of a space propulsion system. The knowledge base approach provides a systematic framework of organizing the load information and facilitates the coupling of the numerical processing and symbolic (information) processing. It provides an incremental development environment for building generic probabilistic load models and book keeping the associated load information. A large volume of load data is stored in the data base and can be retrieved and updated by a built-in data base management system. The data base system standardizes the data storage and retrieval procedures. It helps maintain data integrity and avoid data redundancy. The intelligent data base paradigm provides ways to build expert system rules for shallow and deep reasoning and thus provides expert knowledge to help users to obtain the required probabilistic load spectra. Derived from text

N93-31571*# Northwestern Univ., Evanston, IL.
PROBABILISTIC FRACTURE FINITE ELEMENTS **c39**
W. K. Liu, T. Belytschko, and Y. J. Lua *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 137-144 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

The Probabilistic Fracture Mechanics (PFM) is a promising method for estimating the fatigue life and inspection cycles for mechanical and structural components. The Probability Finite Element Method (PFEM), which is based on second moment analysis, has proved to be a promising, practical approach to handle problems with uncertainties. As the PFEM provides a powerful computational tool to determine first and second moment of random parameters, the second moment reliability method can be easily combined with PFEM to obtain measures of the reliability of the structural system. The method is also being applied to fatigue crack growth. Uncertainties in the material properties of advanced materials such as polycrystalline alloys, ceramics, and composites are commonly observed from experimental tests. This is mainly attributed to intrinsic microcracks, which are randomly distributed as a result of the applied load and the residual stress. Derived from text

N93-31572*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
MAPPING METHODS FOR COMPUTATIONALLY EFFICIENT AND ACCURATE STRUCTURAL RELIABILITY **c38**
Michael C. Shiao (Sverdrup Technology, Inc., Brook Park, OH.) and Christos C. Chamis *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 145-158 (For primary document see N93-31552 12-20)
Avail: CASI HC A03/MF A03

The influence of mesh coarseness in the structural reliability is evaluated. The objectives are to describe the alternatives and to demonstrate their effectiveness. The results show that special mapping methods can be developed by using: (1) deterministic structural responses from a fine (convergent) finite element mesh; (2) probabilistic distributions of structural

responses from a coarse finite element mesh; (3) the relationship between the probabilistic structural responses from the coarse and fine finite element meshes; and (4) probabilistic mapping. The structural responses from different finite element meshes are highly correlated. Derived from text

N93-31573*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

PROBABILISTIC SIMULATION OF THE HUMAN FACTOR IN STRUCTURAL RELIABILITY **c54**

Ashwin R. Shah (Sverdrup Technology, Inc., Brook Park, OH.) and Christos C. Chamis *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 159-168 (For primary document see N93-31552 12-20)

Avail: CASI HC A02/MF A03

Many structural failures have occasionally been attributed to human factors in engineering design, analyses maintenance, and fabrication processes. Every facet of the engineering process is heavily governed by human factors and the degree of uncertainty associated with them. Factors such as societal, physical, professional, psychological, and many others introduce uncertainties that significantly influence the reliability of human performance. Quantifying human factors and associated uncertainties in structural reliability require: (1) identification of the fundamental factors that influence human performance, and (2) models to describe the interaction of these factors. An approach is being developed to quantify the uncertainties associated with the human performance. This approach consists of a multi factor model in conjunction with direct Monte-Carlo simulation.

Derived from text

N93-31574*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

OVERVIEW OF THE FATIGUE/FRACTURE/LIFE PREDICTION WORKING GROUP PROGRAM AT THE LEWIS RESEARCH CENTER **Abstract Only** **c38**

Michael A. McGaw *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 169-170 (For primary document see N93-31552 12-20)

Avail: CASI HC A01/MF A03

The objective is to develop and verify constitutive and life prediction models for materials typically used in hot gas path components of reusable space propulsion systems over the range of relevant operative environments. The efforts were concentrated on the development of crack initiation life prediction methods and on the development of cyclic crack propagation and fracture life prediction methods. Derived from text

N93-31575*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

CUMULATIVE FATIGUE DAMAGE BEHAVIOR OF MAR M-247 **c39**

Michael A. McGaw, Gary R. Halford, and Sreeramesh Kalluri (Sverdrup Technology, Inc., Brook Park, OH.) *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 173-177 (For primary document see N93-31552 12-20)

Avail: CASI HC A01/MF A03

The objective was to examine the room temperature fatigue and nonlinear cumulative fatigue damage behavior of the cast nickel-based superalloy, MAR M-247. The fatigue test matrix consisted of single-level, fully reversed fatigue experiments. Two series of tests were performed: one of the two baseline fatigue LCF (Low-Cycle Fatigue) life levels was used in the first loading block, and the HCF (High-Cycle Fatigue) baseline loading level was used in the second block in each series. For each series, duplicate tests were performed at each applied LCF life fraction. Derived from text

N93-31576*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

THE EFFECT OF POROSITY AND GAMMA-GAMMA' EUTECTIC CONTENT ON THE LOW CYCLE FATIGUE BEHAVIOR OF HYDROGEN-CHARGED PWA-1480 **c26**

John Gayda, Robert L. Dreshfield, and Timothy P. Gabb *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 179-185 (For primary document see N93-31552 12-20)

Avail: CASI HC A02/MF A03

Single crystal superalloys such as PWA 1480 are considered for turbopump blades in the main engines of the space shuttle. As fatigue resistance in a hydrogen environment is a key issue in this application, a study of the effect of porosity and gamma-gamma' eutectic content on the fatigue life of a hydrogen-charged PWA 1480 was performed. Porosity and eutectic were linked to fatigue initiation, and therefore reduction of either of both may be one means to improve fatigue life of PWA 1480 when hydrogen is present. Derived from text

N93-31577*# Rockwell International Corp., Canoga Park, CA. Rocketdyne Div.

CONSTITUTIVE AND DAMAGE MATERIAL MODELING IN A HIGH PRESSURE HYDROGEN ENVIRONMENT

D. A. Russell and L. G. Fritzemeier *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 187-196 (For primary document see N93-31552 12-20) (Contract NAS3-26130)

Avail: CASI HC A02/MF A03

Numerous components in reusable space propulsion systems such as the SSME are exposed to high pressure gaseous hydrogen environments. Flow areas and passages in the fuel turbopump, fuel and oxidizer preburners, main combustion chamber, and injector assembly contain high pressure hydrogen either high in purity or as hydrogen rich steam. Accurate constitutive and damage material models applicable to high pressure hydrogen environments are therefore needed for engine design and analysis. Existing constitutive and cyclic crack initiation models were evaluated only for conditions of oxidizing environments. The main objective is to evaluate these models for applicability to high pressure hydrogen environments.

Derived from text

N93-31578*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

SECONDARY ORIENTATION EFFECTS IN A SINGLE CRYSTAL SUPERALLOY UNDER MECHANICAL AND THERMAL LOADS **c26**

Sreeramesh Kalluri (Sverdrup Technology, Inc., Brook Park, OH.), Ali Abdul-Aziz (Sverdrup Technology, Inc., Brook Park, OH.), and Michael A. McGaw *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 197-206 (For primary document see N93-31552 12-20)

Avail: CASI HC A02/MF A03

The nickel-base single crystal superalloy PWA 1480 is a candidate blading material for the advanced turbopump development program of the SSME. In order to improve thermal fatigue resistance of the turbine blades, the single crystal superalloy PWA 1480 is grown along the low modulus zone axes (001) crystal orientation by a directional solidification process. Since cubic single crystal materials such as PWA 1480 exhibit anisotropic elastic behavior, the stresses developed within the single crystal superalloy due to mechanical and thermal loads are likely to be affected by the exact orientation of the secondary crystallographic direction with respect to the geometry of the turbine blade. The effects of secondary crystal orientation on the elastic response of single crystal PWA 1480 superalloy were investigated. Derived from text

N93-31579*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

A MODEL FOR PREDICTING HIGH-TEMPERATURE FATIGUE FAILURE OF A W/Cu COMPOSITE **c24**

M. J. Verrilli, Y.-S. Kim (National Academy of Sciences - National Research Council, Washington, DC.), and T. P. Gabb *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 207-218 (For primary document see N93-31552 12-20)

Avail: CASI HC A03/MF A03

The material studied, a tungsten-fiber-reinforced, copper-matrix composite, is a candidate material for rocket nozzle liner applications. It was shown that at high temperatures, fatigue cracks initiate and propagate inside the copper matrix through a process of initiation, growth, and coalescence of grain boundary cavities. The ductile tungsten fibers neck and rupture locally after the surrounding matrix fails, and complete failure of the composite then ensues. A simple fatigue life prediction model is presented for the tungsten/copper composite system. Derived from text

N93-31580*# Rockwell International Corp., Canoga Park, CA. Rocketdyne Div.

EXAMINATION OF THE EFFECT OF PROPULSION SYSTEM PERFORMANCE VARIABLES ON THE LIFE PREDICTION FOR THE SSME LOX POST

D. A. Russell, K. R. Rajagopal, G. Orient, and J. Keremes *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 219-227 (For primary document see N93-31552 12-20)

Avail: CASI HC A02/MF A03

The main objective is to calculate damage evolution at the critical location of selected components of reusable space propulsion systems as the function of their operating environments and to relate the evolution of damage at the critical locations to the performance variables of the propulsion system using advanced constitutive and damage models. The models so developed will be oriented toward use in an advanced diagnostic/prognostic health monitoring system for reusable propulsion systems. The components to be modelled include a Lox Post (injector element), a thrust chamber, and a turbine blade. The study conducted on the Lox Post is reported. Derived from text

N93-31581*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

LIFE EXTENDING CONTROL: AN INTERDISCIPLINARY ENGINEERING THRUST

Carl F. Lorenzo and Walter C. Merrill *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 229-237 (For primary document see N93-31552 12-20)

Avail: CASI HC A02/MF A03

The concept of Life Extending Control (LEC) is introduced. Possible extensions to the cyclic damage prediction approach are presented based on the identification of a model from elementary forms. Several candidate elementary forms are presented. These extensions will result in a continuous or differential form of the damage prediction model. Two possible approaches to the LEC based on the existing cyclic damage prediction method, the measured variables LEC and the estimated variables LEC, are defined. Here, damage estimates or measurements would be used directly in the LEC. A simple hydraulic actuator driven position control system example is used to illustrate the main ideas behind LEC. Results from a simple hydraulic actuator example demonstrate that overall system performance (dynamic plus life) can be maximized by accounting for component damage in the control design. Derived from text

N93-31582*# Army Aviation Systems Command, Cleveland, OH.

AXIAL AND TORSIONAL FATIGUE BEHAVIOR OF A COBALT-BASE ALLOY **c26**

Peter J. Bonacuse and Sreeramesh Kalluri (Sverdrup Technology, Inc., Brook Park, OH.) *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 239-246 (For primary document see N93-31552 12-20)

Avail: CASI HC A02/MF A03

In order to develop elevated temperature multiaxial fatigue life prediction models for the wrought cobalt-base alloy, Haynes 188, a multiaxial fatigue data base is required. To satisfy this need, an elevated temperature experimental program on Haynes 188 consisting of axial, torsional, inphase and out of phase axial-torsional fatigue experiments was designed. Elevated temperature axial and torsional fatigue experiments were conducted under strain control on thin wall tubular specimens of Haynes 188 in air. Test results are given. Derived from text

N93-31583*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

OVERVIEW OF AEROTHERMODYNAMIC LOADS DEFINITION STUDY

Raymond E. Gaugler *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 247-254 (For primary document see N93-31552 12-20)

Avail: CASI HC A02/MF A03

The objective of the Aerothermodynamic Loads Definition Study is to develop methods of accurately predicting the operating environment in advanced Earth-to-Orbit (ETO) propulsion systems, such as the Space Shuttle Main Engine (SSME) powerhead. Development of time averaged and time dependent three dimensional viscous computer codes as well as experimental verification and engine diagnostic testing are considered to be essential in achieving that objective. Time-averaged, nonsteady, and transient operating loads must all be well defined in order to accurately predict powerhead life. Described here is work in unsteady heat flow analysis, improved modeling of preburner flow, turbulence modeling for turbomachinery, computation of three dimensional flow with heat transfer, and unsteady viscous multi-blade row turbine analysis. Derived from text

N93-31584*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

THREE-DIMENSIONAL ANALYSIS OF THE PRATT AND WHITNEY ALTERNATE DESIGN SSME FUEL TURBINE **c37**

K. R. Kirtley (Sverdrup Technology, Inc., Brook Park, OH.), T. A. Beach (Sverdrup Technology, Inc., Brook Park, OH.), and J. J. Adamczyk *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 255-262 (For primary document see N93-31552 12-20)

Avail: CASI HC A02/MF A03

The three dimensional viscous time-mean flow in the Pratt and Whitney alternate design space shuttle main engine fuel turbine is simulated using the average passage Navier-Stokes equations. The migration of secondary flows generated by upstream blade rows and their effect on the performance of downstream blade rows is studied. The present simulation confirms that the flow in this two stage turbine is highly three dimensional and dominated by the tip leakage flow. The tip leakage vortex generated by the first blade persists through the second blade and adversely affects its performance. The greatest mixing of the inlet total temperature distortion occurs in the second vane and is due to the large leakage vortex generated by the upstream rotor. It is assumed that the predominant spanwise mixing mechanism in this low aspect ratio turbine is the radial transport due to the deterministically unsteady vortical flow generated by upstream blade rows. A by-product of the analysis is accurate pressure and heat loads for all blade rows under the influence of neighboring blade rows. These aero loads are useful for advanced structural analysis of the vanes and blades. Derived from text

N93-31585*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

THREE-DIMENSIONAL FLOW CALCULATIONS INSIDE SSME GGGT FIRST STAGE BLADE ROWS

Chunill Hah, Steven Nash (Sverdrup Technology, Inc., Brook Park, OH.), and Gregory Swartwout *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 263-271 (For primary document see N93-31552 12-20)

Avail: CASI HC A02/MF A03

A numerical analysis of the first stage of the Space Shuttle Main Engine (SSME) GGGT was conducted using a 3-D Reynolds averaged Navier-Stokes flow solver. This turbine stage was designed to improve both aerodynamic efficiency and durability. The blade has an unconventional shape with a large blade thickness. No experimental data is available to verify the computational results. The objective of the current study is to analyze this turbine blade stage with a well established Navier-Stokes computational method in order to determine if the turbine is operating in the subsonic flow regime and if these are any significant separated flow regions. The stage was analyzed in a steady state flow condition. The inlet vane was analyzed with the flow conditions from the axisymmetric entire stage solution. The viscous flow solution of the first vane is used as the inlet flow condition for the rotor. Derived from text

N93-31586*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

LOCALIZATION OF AEROELASTIC MODES IN MISTUNED HIGH-ENERGY TURBINES **c37**

Todd E. Smith (Sverdrup Technology, Inc., Brook Park, OH.), Christophe Pierre (Michigan Univ., Ann Arbor.), and Durbha V. Murthy (Toledo Univ., OH.) *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 273-280 (For primary document see N93-31552 12-20)

Avail: CASI HC A02/MF A03

The effects of blade mistuning on the aerodynamic characteristics of a class of bladed-disk assemblies, namely high energy turbines, are discussed. The specific rotor analyzed is the first stage of turbine blades of the oxidizer turbopump in the Space Shuttle Main Engine. The common

occurrence of fatigue cracks for these turbine blades indicates the possibility of high dynamic loading. Since mistuning under conditions of weak interblade coupling has been shown to increase blade response amplitudes drastically for simple structural models of blade assemblies, it provides a plausible explanation for the occurrence of cracks. The focus here is on the effects of frequency mistuning on the aeroelastic stability of the assembly and on the aeroelastic mode shapes. Derived from text

N93-31587*# Calspan-Buffalo Univ. Research Center, NY.
HEAT TRANSFER AND PRESSURE MEASUREMENTS FOR THE SSME FUEL TURBINE c37
Michael G. Dunn and Jungho Kim *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 281-282 (For primary document see N93-31552 12-20)
Avail: CASI HC A01/MF A03

A measurement program is underway using the Rocketdyne two-stage Space Shuttle Main Engine (SSME) fuel turbine. The measurements use a very large shock tunnel to produce a short-duration source of heated and pressurized gas which is subsequently passed through the turbine. Within this environment, the turbine is operated at the design values of flow function, stage pressure ratio, stage temperature ratio, and corrected speed. The first stage vane row and the first stage blade row are instrumented in both the spanwise and chordwise directions with pressure transducers and heat flux gages. The specific measurements to be taken include time averaged surface pressure and heat flux distributions on the vane and blade, flow passage static pressure, flow passage total pressure and total temperature distributions, and phase resolved surface pressure and heat flux on the blade. Derived from text

N93-31588*# Pennsylvania State Univ., University Park.
PENN STATE AXIAL FLOW TURBINE FACILITY: PERFORMANCE AND NOZZLE FLOW FIELD c34
B. Lakshminarayana, M. Zaccaria, and S. Itoh (National Defence Academy, Yokosuka, Japan.) *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 283-292 (For primary document see N93-31552 12-20)
(Grant NAG3-555)
Avail: CASI HC A02/MF A03

The objective is to gain a thorough understanding of the flow field in a turbine stage including three-dimensional inviscid and viscid effects, unsteady flow field, rotor-stator interaction effects, unsteady blade pressures, shear stress, and velocity field in rotor passages. The performance of the turbine facility at the design condition is measured and compared with the design distribution. The data on the nozzle vane static pressure and wake characteristics are presented and interpreted. The wakes are found to be highly three-dimensional, with substantial radial inward velocity at most spanwise locations. Derived from text

N93-31845*# SECA, Inc., Huntsville, AL.
RADIATION/CONVECTION COUPLING IN ROCKET MOTOR AND PLUME ANALYSIS Final Report
A. J. Saladino and R. C. Farmer Jul. 1993 44 p
(Contract NAS8-39811)
(NASA-CR-193288; NAS 1.26:193288; SECA-FR-93-10) Avail: CASI HC A03/MF A01

A method for describing radiation/convection coupling to a flow field analysis was developed for rocket motors and plumes. The three commonly used propellant systems (H2/O2, RP-1/O2, and solid propellants) radiate primarily as: molecular emitters, non-scattering small particles (soot), and scattering larger particles (Al2O3), respectively. For the required solution, the divergence of the radiation heat flux was included in the energy equation, and the local, volume averaged intensity was determined by a solution to the radiative transfer equation. A rigorous solution to this problem is intractable, therefore, solution methods which use the ordinary and improved differential approximation were developed. This radiation model was being incorporated into the FDNS code, a Navier-Stokes flowfield solver for multiphase, turbulent combusting flows. Author (revised)

N93-31858*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
NASA'S PROGRESS IN NUCLEAR ELECTRIC PROPULSION TECHNOLOGY
James R. Stone, Michael P. Doherty, and Keith M. Peecook Jun. 1993 18 p Presented at the AIAA 29th Joint Propulsion Conference and Exhibit, Monterey, CA, 28-30 Jun. 1993; sponsored by AIAA, SAE, ASME, and ASEE
(RTOP 584-04-21)
(NASA-TM-106272; E-8000; AIAA Paper 93-1936; NAS 1.15:106272)
Avail: CASI HC A03/MF A01

The National Aeronautics and Space Administration (NASA) has established a requirement for Nuclear Electric Propulsion (NEP) technology for robotic planetary science mission applications with potential future evolution to systems for piloted Mars vehicles. To advance the readiness of NEP for these challenging missions, a near-term flight demonstration on a meaningful robotic science mission is very desirable. The requirements for both near-term and outer planet science missions are briefly reviewed, and the near-term baseline system established under a recent study jointly conducted by the Lewis Research Center (LeRC) and the Jet Propulsion Laboratory (JPL) is described. Technology issues are identified where work is needed to establish the technology for the baseline system, and technology opportunities which could provide improvement beyond baseline capabilities are discussed. Finally, the plan to develop this promising technology is presented and discussed. Author

N93-32184# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, ID.
STUDY OF WALL HEAT TRANSFER FROM A HIGH TEMPERATURE DISSOCIATED HYDROGEN IMPINGING JET
L. A. Stickler and C. H. Chang 1992 11 p Presented at the Idaho National Engineering Laboratory Computing Symposium, Idaho Falls, ID, 22-24 Sep. 1992
(Contract DE-AC07-76ID-01570)
(DE92-017845; EGG-M-92261; CONF-9209166-1) Avail: CASI HC A03/MF A01

Numerical simulations, using a newly developed computer code, LAVA, are performed in order to determine the heat transfer at the thrust chamber wall of a nuclear thermal rocket due to impinging jets of high temperature dissociated hydrogen propellant. The propellant discharging from the nuclear reactor is modeled as a two dimensional circular jet at a temperature of 3200 K with an average Mach number of 0.3. Solid surfaces are assumed to be fully catalytic. Three cases of thrust chamber wall temperature were examined, 2500, 2750, and 3000 K. Recombination of atomic hydrogen at the wall is the dominating heat transfer mechanism. A minimum heat flux of 7.8 MW/sq m is obtained at a wall temperature of 2500 K. DOE

N93-32353*# TRW Systems Group, Redondo Beach, CA. Space and Technology Group.
THE PIT MkV PULSED INDUCTIVE THRUSTER
C. Lee Dailey and Ralph H. Lovberg (California Univ., San Diego.) Jul. 1993 52 p
(Contract NAS1-19291; RTOP 506-42-42)
(NASA-CR-191155; E-7941; NAS 1.26:191155) Avail: CASI HC A04/MF A01

The pulsed inductive thruster (PIT) is an electrodeless, magnetic rocket engine that can operate with any gaseous propellant. A puff of gas injected against the face of a flat (spiral) coil is ionized and ejected by the magnetic field of a fast-rising current pulse from a capacitor bank discharge. Single shot operation on an impulse balance has provided efficiency and I(sub sp) data that characterize operation at any power level (pulse rate). The 1-m diameter MkV thruster concept offers low estimated engine mass at low powers, together with power capability up to more than 1 MW for the 1-m diameter design. A 20 kW design estimate indicates specific mass comparable to Ion Engine specific mass for 10,000 hour operation, while a 100,000 hour design would have a specific mass 1/3 that of the Ion Engine. Performance data are reported for ammonia and hydrazine. With ammonia, at 32 KV coil voltage, efficiency is a little more than 50 percent from 4000 to more than 8000 seconds I(sub sp). Comparison with data at 24 and 28 kV indicates that a wider I(sub sp) range could be achieved at higher coil voltages, if required for deep space missions. Author (revised)

23 CHEMISTRY AND MATERIALS (GENERAL)

N93-31830 National Inst. of Standards and Technology, Gaithersburg, MD. Standard Reference Materials Program.
STANDARD REFERENCE MATERIALS: HANDBOOK FOR SRM USERS Special Publication
J. K. Taylor and N. M. Trahey Feb. 1993 122 p Supersedes PB86-110897 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB93-183796; NIST-SP-260-100) Avail: Issuing Activity (National Technical Information Service (NTIS))

The handbook was prepared to provide guidance for the use of Standard Reference Materials (SRMs) to provide an accuracy base for chemical measurements. The general concepts of precision and accuracy, and their realization by quality assurance of the measurement process, are discussed. General characteristics of SRMs are described and guidance given on their selection for specific applications. Ways to effectively use SRMs are recommended, including the utilization of control charts to evaluate and monitor measurement accuracy. Appendices provide statistical guidance on the evaluation of measurement uncertainty. NTIS

N93-31870# Pennsylvania State Univ., University Park. Center for Advanced Materials.
PROJECTS WITHIN THE CENTER FOR ADVANCED MATERIALS Annual Report No. 5, 1 Jun. 1990 - 31 May 1991
J. R. Hellmann and S. R. Nestlerode May 1992 42 p See also PB91-240655 Sponsored by Gas Research Inst., Chicago, IL
(Contract GRI-5084-238-1302)
(PB93-175222; CAM-9106.1; GRI-91/0212.1) Avail: CASI HC A03/MF A01

The Center for Advanced Materials (CAM) at Pennsylvania State University serves as a focal point for high performance materials research and development. The research and development is targeted to aid the industrial natural gas end-user. The timely application of state-of-the-art materials in waste heat recovery systems, advanced gas-fired heating and melting systems, and gas-fired prime movers will help to ensure more widespread, efficient use of natural gas. The Center's projects are separated into three complementary groups: (1) projects involving the assessment of materials technology and its dissemination between research and development activities and the end-user community; (2) projects focusing on the engineering evaluation and development of materials technologies enhancing a wide range of natural gas systems and processes; and (3) projects identifying existing and emerging advanced materials, improved materials-fabrication processes, and fundamental issues related to the use of advanced materials. NTIS

24 COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

For ceramic materials see *27 Nonmetallic Materials.*

N93-31044# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (Germany). Hubschrauber und Flugzeuge.
CONSIDERATION OF IMPACT DAMAGES BY DIMENSIONING CFC (CARBON FIBER REINFORCED COMPOSITES) COMPONENTS [BERUECKSICHTIGUNG VON IMPACT-SCHAEDEN BEI DER DIMENSIONIERUNG VON CFK-BAUTEILEN]
J. Bauer Jun. 1991 10 p In GERMAN Presented at DGLR-Symposium Leichtbaustrukturen unter Kurzzeiter Beanspruchung (Impact, Crash), Bremen, Germany, 6-7 Jun. 1991 Submitted for publication
(MBB-FE-221-S-PUB-0501; DGLR-91-27; ETN-93-94193) Copyright Avail: CASI HC A02/MF A01

A method for adapting damage tolerance of structures to aircraft requirements is presented. Material properties were recalled which are needed for military aircraft design and development, such as traction and compression modules and residual stresses with consideration of weight reduction. The qualities of resin fiber systems were highlighted, such as fracture toughness. The structure influence on damage tolerance was characterized, in terms of absorbed damage energy. It is concluded, that the damage tolerance of a composite structure depends on geometric conditions such as density and curvatures. A statistical dimensioning criterion is proposed, which limits dilatation in fibers, for estimating wall strength. A compression after impact test was carried out, and impact energy was defined as dimensioning characteristic value. ESA

N93-31065# Naval Surface Warfare Center, Bethesda, MD.
MEASUREMENT OF THE OUT-OF-PLANE SHEAR RESPONSE OF THICK SECTION COMPOSITE MATERIALS USING THE V-NOTCHED BEAM SPECIMEN Research and Development Report, Oct. 1990 - Sep. 1992
K. Gipple and D. Hoyns Oct. 1992 45 p
(AD-A264898; CRDKNSWC-SSM-64-92/22) Avail: CASI HC A03/MF A01

The out-of-plane shear response of thick, unidirectional, and crossply, AS4/3501-6 and S2 glass/3501-6 laminates was investigated theoretically and experimentally. The specimens considered were of the V-notched beam configuration. Strains were monitored in the specimen test sections using conventional strain gages, moire interferometry, and new full section strain gages. Crossply laminates exhibited a fairly uniform strain distribution away from the notches resulting in agreement of initial moduli obtained through all three strain measurement methods. Strains measured with conventional gages centered between the notches of the unidirectional specimens exceeded the average strain from notch to notch, as measured by moire interferometry and the full section data. Measured strains correlated very well with predicted strains from specimen finite element analyses using nonlinear elastic material properties. DTIC

N93-31136 California Univ., Los Angeles.
COMPRESSIVE STRENGTHS OF FIBER-REINFORCED COMPOSITES WITH INTERFACE DEBONDING Ph.D. Thesis
Shun-Fa Hwang 1992 130 p
Avail: Univ. Microfilms Order No. DA9310961

One method to increase the compressive strengths of composites without seriously affecting other important properties is to co-mingle two different fiber systems. Manufacture of such composites may lead to interface debonding and low interface strength. An assessment of the role of interface debonding upon the compressive strengths of such composites needs to be conducted. Generally the compression failure models are shear failure and buckling failure which includes extension and shear modes. Without considering interface debonding, micro-buckling failure theory is extended to account for the nonlinear effects of the fiber and matrix by using Ramberg-Osgood stress-strain relations and the tangential modulus concept. In the case of shear failure, a more appropriate method to estimate the shear strength of each component is proposed. The effect of fiber co-mingling can be estimated from the controlling mode. The effects of interface debonding are represented by a pattern of single-row or multi-row interface cracks. The elasticity theory of incremental deformation is used to describe the fiber buckling behavior around the weakened regions. Depending upon the interface conditions, one to three pairs of dual integral or series equations are obtained and converted to systems of Cauchy singular integral equations. These equations are numerically solved by using the special properties of Jacobi polynomials. The results are compared with predictions for perfect interfaces and the effect of fiber co-mingling under the influence of interface debonding is assessed. Dissert. Abstr.

N93-31143 California Univ., San Diego.
OVERALL PROPERTIES OF COMPOSITE MATERIALS: A GENERAL MODEL BASED ON PERIODIC MICROSTRUCTURE Ph.D. Thesis
Niann-i Yu 1992 149 p
Avail: Univ. Microfilms Order No. DA9312117

A general micromechanically-based model is developed in a systematic manner to determine the overall properties of a broad class of linearly elastic composite materials. The composite materials are modeled as infinite solids containing periodically distributed inhomogeneities. In view of the periodicity, the elastic field of the composite material can be expressed in Fourier series. Exact upper and lower bounds on the overall moduli of multi-phase composites are obtained by using the generalized Hashin-Shtrikman variational principles. The interactions among the inhomogeneities are accounted for in an explicit and direct manner. Explicit expressions and numerous examples for two-phase composite materials,

including particulate, whisker, and fiber-reinforced composites, are presented. The solution for the extreme case of solids containing periodical cracks is derived by considering flat voids first and then letting the thickness aspect ratio of the void approaching zero. This limiting case is taken with care. In addition to the bounding formulation, two micromechanics models, which are also based on the periodic microstructure and emerge from the bounding solution, are developed to estimate the overall moduli of composite materials. These estimates fall within the bounds. Dissert. Abstr.

N93-31293*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

SiC FIBER-REINFORCED CELSIAN GLASS-CERAMIC MATRIX COMPOSITE Patent Application

Narottam P. Bansal, inventor (to NASA) 16 Apr. 1992 7 p
(NASA-Case-LEW-15264-1; NAS 1.71:LEW-15264-1;
US-Patent-Appl-SN-872262) Avail: CASI HC A02/MF A01

A fiber-reinforced composite composed of a BaO-Al2O3-2SiO2 (BAS) glass ceramic matrix is reinforced with CVD silicon carbide continuous fibers. A slurry of BAS glass powders is cast into tapes which are cut to the proper size. Continuous CVD-SiC fibers are formed into mats of the desired size. The matrix tapes and the fiber mats are alternately stacked in the proper orientation. This tape-mat stack is warm pressed to produce a 'green' composite. The 'green' composite is then heated to an elevated temperature to burn out organic constituents. The remaining interim material is then hot pressed to form a silicon carbide fiber-reinforced celsian (BAS) glass-ceramic matrix composite which may be machined to size. NASA

N93-31296*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

METHOD FOR PRODUCING HYBRID GRAPHITE COMPOSITE Patent Application

James R. Gaier, inventor (to NASA) 22 Jul. 1993 13 p
(NASA-Case-LEW-15241-2; NAS 1.71:LEW-15241-2;
US-Patent-Appl-SN-094732) Avail: CASI HC A03/MF A01

Highly conducting lightweight hybrid materials are obtained by weaving strands of carbon or graphite fibers into a 2-dimensional fabric-like structure, depositing a layer of carbon onto the fibers of the fabric-like structure, heating the fabric-like structure to graphitize the carbon layer and intercalating the graphitized carbon layer. Composite materials for use in lightning strike protection are composed of at least one layer of the highly conducting lightweight hybrid material and at least one layer of traditional composite materials. NASA

N93-31299*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

METHOD OF PRODUCING A CERAMIC FIBER-REINFORCED GLASS-CERAMIC MATRIX COMPOSITE Patent Application

N. P. Bansal, inventor (to NASA) 30 Jun. 1993 8 p
(NASA-Case-LEW-15264-2; NAS 1.71:LEW-15264-2;
US-Patent-Appl-SN-084058) Avail: CASI HC A02/MF A01

A fiber-reinforced composite composed of a BaO-Al2O3-2SiO2 (BAS) glass ceramic matrix is reinforced with CVD silicon carbide continuous fibers. A slurry of BAS glass powders is prepared and celsian seeds are added during ball melting. The slurry is cast into tapes which are cut to the proper size. Continuous CVD-SiC fibers are formed into mats of the desired size. The matrix tapes and the fiber mats are alternately stacked in the proper orientation. This tape-mat stack is warm pressed to produce a 'green' composite. The 'green' composite is then heated to an elevated temperature to burn out organic constituents. The remaining interim material is then hot pressed to form a silicon carbide fiber-reinforced celsian (BAS) glass-ceramic matrix composite which may be machined to size. NASA

N93-31334# Southwest Research Inst., San Antonio, TX.

LONG-TERM RELIABILITY OF GAS PIPELINE REPAIRS BY REINFORCED COMPOSITES. ANNUAL REPORT, JULY 1991-JUNE 1992 Annual Report, Jul. 1991 - Jun. 1992

C. H. Parr, D. R. Stephens, C. J. Kuhlman, S. Roy, and K. Pagalthivarthi Mar. 1993 171 p Sponsored by Gas Research Inst., Chicago, IL
Prepared in cooperation with Battelle, Columbus, OH
(Contract GRI-5091-271-2187)
(PB93-188647; GRI-92/0507) Avail: CASI HC A08/MF A02

Replacement and rehabilitation of corrosion defects in the approximately 400,000 miles of high-pressure transmission and gathering line pipe result in substantial annual costs to the industry. Repair of dent damage due to third-party construction equipment, the most prevalent type of incident, adds significantly to the cost. A multifaceted program was devised which included the development of a repair analysis model, development of mechanical data for glass/resin composite materials for a variety of environmental conditions, full-scale laboratory testing of reinforced pipe, finite element modeling to correlate the analytical model with the experimental results, and field installations of composite repairs to quantify environmental degradation. Full-scale laboratory pipe tests demonstrated that composite reinforcement is effective in repairing certain types of simulated corrosion defects. NTIS

N93-31461# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Stuttgart (Germany). Inst. fuer Bauweisen- und Konstruktionsforschung.

HIGH CYCLE FATIGUE OF GLASS FIBRE REINFORCED EPOXY MATERIALS FOR WIND TURBINES

Christoph W. Kensche Apr. 1992 80 p
(Contract EN3W-0041-D)
(DLR-FB-92-17; ETN-93-93735) Avail: CASI HC A05/MF A01; DLR, VB-PL-D O, Postfach 90 60 58, 5000 Cologne, Germany, HC

In the foreseen 20 years life time of wind turbines, the rotor blades which in general are made of Gl-Ep (Glass Epoxy) achieve more than 10(exp 8) load cycles. However, for a reliable life time prediction high cycle fatigue data were missed up to now. Therefore, relevant investigations on both Gl-Ep specimens and spar beams including the load attachment to the hub were carried out. The experiments enclosed sinusoidal one step tests and the wind energy specific load sequence WISPER. For the Gl-Ep specimens a life time prediction was performed with the linear Miner rule on the basis of a constant amplitude life diagram designed by the fatigue data. Concerning the spar beams it was shown that they safely can withstand maximum strains of more than -0.6%. Frequency response and damping measurements were carried out at certain stages during the service life, but could not discover in due time an impending failure. ESA

N93-31650*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

DESIGN OF MULTIPLE-PLY LAMINATED COMPOSITE TAPERED BEAMS

P. Rodriguez Jun. 1993 41 p
(NASA-TM-108411; NAS 1.15:108411) Avail: CASI HC A03/MF A01

A study of a special case of symmetric laminated composite cantilever beams is presented. The approach models beams that are tapered both in depth and width and investigates the effect of the ply layup angle and the ply taper on bending and interlaminar shearing stresses. For the determination of stresses and deflections, the beam stiffness matrices are expressed as linear functions of the beam length. Using classical lamination theory (CLT) the stiffness matrices are determined and assembled at strategic locations along the length of the beam. They are then inverted and necessary stiffness parameters are obtained numerically and extracted for determination of design information at each location chosen. Several ply layup configurations are investigated, and design considerations are presented based on the findings. Finally, recommendations for the design of these beams are presented, and a means for anticipating the location of highest stresses is offered. Author

N93-31736 National Physical Lab., Teddington (England). Materials Metrology Div.

INVESTIGATION OF THE ELECTROCHEMICAL POLARISATION BEHAVIOUR OF SiC/6061 Al METAL MATRIX COMPOSITES

A. J. Griffiths and A. Turnbull Oct. 1992 33 p
(NPL-DMM(A)-31; ETN-93-94031) Copyright Avail: Issuing Activity
(National Physical Lab., Teddington, Middlesex, TW11 0LW, England)

Electrochemical polarization measurements were performed on silicon carbide (SiC), 6061 aluminum metal-silicon carbide metal matrix composite and the similarly processed unreinforced alloy in aerated and deaerated 3.5 wt % NaCl. The effect of the pH of deaerated solutions was also evaluated. Electrochemical polarization measurements were made with alloys with different processing histories. The cathodic current density measured in SiC was similar to the unreinforced Al alloy in aerated conditions by an order of magnitude smaller than the unreinforced Al alloy in deaerated conditions. The results suggest that there is no basis for significant galvanic

interaction between the SiC and Al alloy in SiC/6061 Al. In aerated, stirred 3.5 wt % NaCl solution of initial pH 5.8, the cathodic current for SiC(sub p)/6061 Al was three times greater than for 6061 Al. Increasing the fraction of SiC particles in 6061 Al from 15 to 30 wt % increased the cathodic current in deaerated, stirred 3.5 wt % NaCl by less than a factor of two. ESA

N93-31740# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).
COMPOSITES DESIGN HANDBOOK: UPDATE
Feb. 1992 498 p Revised
(ESA-PSS-03-1101-Issue-1-Rev-2; ESA-PSS-03-1101-Issue-1-Rev-1; ETN-93-94035) Avail: CASI HC A21/MF A04

This volume consists of a set of new and revised pages of the composites design handbook. Changes on the following topics are provided: basic materials data for laminate design, guidelines on typical laminate mechanical properties, nonstandard composite materials, applicable test methods and standards, stress-strain relations, strength prediction and failure criteria, thermal stresses and displacements, analyzing composites with computers, ESDU data for design with composites, bonded joints, load introduction elements, design of structures, developed structures, design of sandwich structures, design of thin-walled unstiffened and stiffened structures, design of dimensionally stable structures, design for damage tolerance, objective of integrity control, verification of integrity control aspects, inspection and test of composites, procurement specification for raw material, manufacturing aspects, fabrication techniques, and repair of composites. ESA

N93-32029# Army Research Lab., Aberdeen Proving Ground, MD.
A THERMOELASTIC MODEL FOR THICK COMPOSITE RINGS Final Report, Jan. 1991 - Mar. 1992
Jerome T. Tzeng May 1993 36 p
(AD-A264112; ARL-TR-105) Avail: CASI HC A03/MF A01

The thermoelastic response of a thick multilayered composite ring subjected to the sequential addition of layers which undergo instantaneous temperature change and corresponding thermal deformation is modeled. The analysis considers ply-by-ply variations of material properties and fiber orientations. The resulting residual field is examined as a function of important physical parameters such as ring geometry, layer material properties, fiber orientation, and layer sequence. DTIC

N93-32062# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
THE METHOD OF SMOOTHING APPLIED TO COMPOSITE ROUGH SURFACE Final Report, Feb. - Oct. 1990
Gary S. Brown Dec. 1992 29 p
(Contract F19628-89-K-0010)
(AD-A265236; RL-TR-92-307) Avail: CASI HC A03/MF A01

A new solution is developed for the problem of scattering from a randomly rough, perfectly conducting, interface having many scales of roughness. A review of the capabilities and limitations of first order smoothing (FOS) and normalized first order smoothing (NFOS) approximations are carried out first. By combining the concepts contained in NFOS approximation with those of the conventional composite surface scattering model, it is possible to develop a new method that is more robust than its components. The key step is to split the regions of current interaction on the rough surface into near and far zones; the effect of the latter is mainly one of large scale surface shadowing while the former accounts for small scale diffraction. Comparisons with the conventional composite surface scattering model are carried out and a number of improvements are noted. Further improvements in the model, if needed, appear to be tractable. DTIC

N93-32067 Tennessee Univ., Knoxville. Dept. of Engineering Science and Mechanics.
A MECHANICS MODEL FOR THE COMPRESSIVE RESPONSE OF FIBER REINFORCED COMPOSITES
I. Chung and Y. J. Weitsman May 1993 28 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-90-J-1556; NR Proj. R21-43)
(AD-A265556; ESM93-2.0-CM) Avail: CASI HC A03

This article presents a model for the uni-axial compressive response of uni-directionally reinforced fiber composite. The model incorporates the nonlinear shear response and the failure strain of the matrix, accounting for both aspects within a nonlinear field equation which governs the load-deflection process. In addition, the model considers the effects of two kinds of geometric imperfections, namely, initial fiber waviness and random fiber spacing. It is shown that under uni-axial compression random fiber spacing may instigate the formation of severe transverse loadings on the fibers which suggest the existence of a transitional mechanism from micro-buckling to micro-kinking. Computational results are presented which illuminate the effects of several material and geometric factors on the compressive strength of composites. DTIC

N93-32202# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
GARTEUR COMPRESSION BEHAVIOUR OF ADVANCED CFRP
W. G. J. tHart, R. Aoki, H. Bookholt, P. T. Curtis, I. Kroeber, N. Marks, and P. Sigety 23 Jul. 1991 11 p Presented at the AGARD Workshop on Utilization of Advanced Composites in Military Aircraft, San Diego, CA, Oct. 1991
(NLR-TP-91290-U; ETN-93-94067; AD-B169209L) Avail: CASI HC A03/MF A01

The failure behavior of Carbon Fiber Reinforced Plastics (CFRP) under compressive loads is investigated. To evaluate the most appropriate compression test method a round robin test program was performed on unidirectional and multidirectional laminates of the materials: T800/6376, HTA7/982, HTA7/6376, T800/5245, T800/924, IM400/5245 and T400/6376. The results of the round robin test program are discussed. The investigations were performed under a cooperation program carried out by the Group for Aeronautical Research and Technology in Europe (GARTEUR). ESA

N93-32219*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
DAMPING MECHANISMS IN CHEMICALLY VAPOR DEPOSITED SiC FIBERS
James A. DiCarlo and Jon C. Goldsby Jul. 1993 11 p Presented at the International Symposium on Damping of Multiphase Inorganic Materials, Chicago, IL, 2-5 Nov. 1992; sponsored by the Physical Metallurgy and Composites Committee
(RTOP 510-01-50)
(NASA-TM-109236; E-7697; NAS 1.15:109236) Avail: CASI HC A03/MF A01

Evaluating the damping of reinforcement fibers is important for understanding their microstructures and the vibrational response of their structural composites. The damping capacities of two types of chemically vapor deposited silicon carbide fibers were measured from -200 C to as high as 800 C. Measurements were made at frequencies in the range 50 to 15000 Hz on single cantilevered fibers. At least four sources were identified which contribute to fiber damping, the most significant being thermoelastic damping and grain boundary sliding. The mechanisms controlling all sources and their potential influence on fiber and composite performance are discussed. Author (revised)

N93-32234*# Bell Helicopter Co., Fort Worth, TX.
CIVIL TILTROTOR TRANSPORT POINT DESIGN: MODEL 940A Final Report
Charles Rogers and Dale Reisdorfer Apr. 1993 92 p Original contains color illustrations
(Contract NAS1-18796; RTOP 532-06-37-03)
(NASA-CR-191446; NAS 1.26:191446; Rept-699-099-352) Avail: CASI HC A05/MF A01; 10 functional color pages

The objective of this effort is to produce a vehicle layout for the civil tiltrotor wing and center fuselage in sufficient detail to obtain aerodynamic and inertia loads for determining member sizing. This report addresses the parametric configuration and loads definition for a 40 passenger civil tilt rotor transport. A preliminary (point) design is developed for the tiltrotor wing box and center fuselage. This summary report provides all design details used in the pre-design; provides adequate detail to allow a preliminary design finite element model to be developed; and contains guidelines for dynamic constraints. Derived from text

N93-32388# Technical Research Centre of Finland, Espoo. Metals Lab.
PERFORMANCE OF AN IMPACT LOADED SANDWICH PLATE [ISKUKUORMITUKSEN VAIKUTUS LUJITEMUOVIPINTAISEN KERROSLEVYN KESTAEVYYTEEN]
Pertti Auerkari, Pentti Kauppinen, Pekka H. Pankakoski, and Tero Uuttu Sep. 1992 39 p In FINNISH Original contains color illustrations
(VTT-JULK-767; ISBN-9-51-384115-4; ETN-93-94020) Copyright Avail: CASI HC A03/MF A01

The impact resistance of a sandwich composite with carbon fiber reinforced epoxy skin and PVC foam core was investigated by measuring the surface and intermediate layer damage after controlled and repeated impacts with a 20 mm spherical indenter. High resolution ultrasonic mapping was used for characterizing the internal delamination defects. The delamination appeared to be about twice the diameter of the surface indentation, and easily detectable to a diameter below 20 mm, when visual observation of the corresponding surface indentation was already difficult or impossible. Anelastic recovery tended to fade the surface indentation making them gradually invisible. The defect indications were essentially time independent, when ultrasonic mapping was used in defect characterization. The impact damage was also indicated by a loss in residual bending strength, which correlated more closely with the incident impact energy and number of impacts than with the measured defect sizes. The diameter of the delamination defect depended mainly on the incident energy (minus a thickness dependent threshold) and the number of equivalent impacts, N. This is in accordance with the critical energy criterion for fatigue damage, with a stronger dependence on N than for in-plane fatigue. ESA

N93-31579*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
A MODEL FOR PREDICTING HIGH-TEMPERATURE FATIGUE FAILURE OF A W/Cu COMPOSITE
M. J. Verrilli, Y.-S. Kim (National Academy of Sciences - National Research Council, Washington, DC.), and T. P. Gabb *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 207-218
(For primary document see N93-31552 12-20)
Avail: CASI HC A03/MF A03

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*.

N93-31064# Aerospace Corp., El Segundo, CA. Technology Operations.
FLAMMABILITY AND EXPLOSION LIMITS OF H2 AND H2/CO: A LITERATURE REVIEW
Norman Cohen 10 Sep. 1992 26 p
(Contract F04701-88-C-0089)
(AD-A264896; TR-92(2534)-1; SMC-TR-93-19) Avail: CASI HC A03/MF A01

The literature related to the flammability and explosion limits of H2/O2, H2/O2/diluent, CO/H2/O2, and CO/H2/air mixtures is reviewed, with particular attention to those aspects relevant to space- and launch vehicle-related conditions. The discussion is hardly exhaustive but is meant to be reasonably self-contained. Applications to a recent Atlas 2 AC-101 booster system exhaust leak are considered. DTIC

N93-31198# Bureau of Mines, Amarillo, TX. Helium Field Operations.
SIMPLE AND ACCURATE METHOD FOR CALCULATING VISCOSITY OF GASEOUS MIXTURES Report of Investigations, 1993
T. A. Davidson 1993 18 p
(PB93-189751; BM-RI-9456) Avail: CASI HC A03/MF A01

The Bureau of Mines Helium Field Operations has developed a simple and accurate method for calculating the viscosity of gas mixtures. Only the composition of the mixture and the molecular weights and viscosities of the pure components in the mixture are required. The momentum fraction of a mixture is calculated from the composition. The fluidity is calculated as a quadratic function of the momentum fractions. The efficiency factor for transfer of momentum in collisions between bodies of different masses is derived and used with one empirical constant. The viscosity is the reciprocal of the fluidity. NTIS

N93-31209# SRI International Corp., Menlo Park, CA.
NOVEL STRATEGIES FOR THE SYNTHESIS OF METHANE ADSORBENTS WITH CONTROLLED POROSITY AND HIGH SURFACE AREA Final Report, Oct. 1991 - Oct. 1992
S. C. Ventura, G. P. Hum, and S. C. Narang Dec. 1992 37 p
(Contract GRI-5091-260-2238)
(PB93-189967; GRI-93/0018) Avail: CASI HC A03/MF A01

Natural gas is an attractive alternative to gasoline as fuel for cars because of its desirable emission characteristics, good cold starting characteristics, and high octane number. A major factor that limits widespread use of NGVs is the low energy density of natural gas. The energy density can be increased by adsorption of the natural gas on high surface area sorbents. Present carbon adsorbents do not adsorb enough methane on a volume per volume basis to be commercially attractive for storage of methane on natural gas fueled vehicles. The report has begun exploring the use of organic gels for the adsorption of methane. Preliminary results are promising enough to warrant further research. NTIS

N93-31319# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Stuttgart (Germany). Inst. fuer Technische Thermodynamik.
POTENTIAL DISTRIBUTIONS AT GAS EVOLVING ELECTRODES Ph.D. Thesis - Stuttgart Univ. [POTENTIALVERTEILUNG AN GASENTWICKELNDEN ELEKTRODEN]
Volker Kienzlen Jul. 1992 119 p In GERMAN
(DLR-FB-92-20; ETN-93-93737) Avail: CASI HC A06/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

The impact of gas bubbles on potential distribution on a gas evolving electrode is investigated experimentally. In the electrolytic tank, cubic and hexagonal equipotentials are determined. The primary current density distribution between the bubbles on the electrode is measured. Investigations on perforated plate electrodes reveal that the gas bubbles in zero gap cells are formed almost entirely on the surface of the electrode facing the diaphragm. To ensure easy removal of the product gases, the capillary gap between electrode and diaphragm should be in the same order of magnitude as the bubble diameter. Using a new technique, potential distributions are measured as a function of electrolyte velocity at strip electrodes. A pronounced influence on potential distribution can only be observed at very low eletrolyte velocities. The cell voltage curve during the first 5 minutes of operation is analyzed by means of startup tests. The voltage at the electrolysis cell rises with three distinct transitions after the electrical circuit is closed: the first transition is due to the formation of a nearly close packed microbubble layer, the second transition probably stems from the formation of the upper bubble layer, and electrolyte flow effects contribute to the final rise in cell voltage. ESA

N93-31435# Texas A&M Univ., College Station. Dept. of Chemistry.
NEW DIRECTIONS FOR THE CATALYTIC CONVERSION OF METHANE Annual Report, Dec. 1991 - Nov. 1992
J. H. Lunsford Feb. 1993 36 p See also PB92-172360 Sponsored by Gas Research Inst., Chicago, IL
(Contract GRI-5086-260-1326)
(PB93-188795; GRI-93/0077) Avail: CASI HC A03/MF A01

There is a serious need for a catalytic system to convert methane, the principal component of natural gas, to more useful chemicals and fuels, which preferably are in the liquid state. One approach is to carry out a high temperature oxidative coupling reaction to form ethylene. The objectives of the research are twofold: (1) to determine the catalytic properties of Li-MgO solid solutions that contain chloride ions in the oxidative coupling of methane, and (2) to extend the study to the oxidative dehydrogenation of ethane and higher hydrocarbons. NTIS

N93-31459*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
PHENYLETHYNYL ENDCAPPING REAGENTS AND REACTIVE DILUENTS Patent Application
Brian J. Jensen, inventor (to NASA), Robert G. Bryant, inventor (to NASA), and Paul M. Hergenrother, inventor (to NASA) 2 Apr. 1993 21 p

(NASA-Case-LAR-14796-1; NAS 1.71:LAR-14796-1;
US-Patent-Appl-SN-045343) Avail: CASI HC A03/MF A01

A phenylethynyl composition which can be used to endcap nucleophilic species is employed in the production of phenylethynyl terminated reactive oligomers exclusively. These phenylethynyl terminated reactive oligomers display unique thermal characteristics, as exemplified by the model compound, 4-phenoxy 4'-phenylethynylbenzophenone, which is relatively stable at 200 C, but reacts at 350 C. In addition, a reactive diluent was prepared which decreases the melt viscosity of the phenylethynyl terminated oligomers and subsequently reacts therewith to increase density of the resulting thermoset. The novelty of this invention resides in the phenylethynyl composition used to terminate a nucleophilic reagent, resulting in the exclusive production of phenylethynyl terminated reactive oligomers which display unique thermal characteristics. A reactive diluent was also employed to decrease the melt viscosity of a phenylethynyl terminated reactive oligomer and to subsequently react therewith to increase the crosslink density of the resulting thermoset. These materials have features which make them attractive candidates for use as composite matrices and adhesives.
NASA

N93-31521# Technische Univ., Eindhoven (Netherlands). Chemical Process Technology Lab.
KINETICS OF ADSORPTION FROM LIQUID PHASE ON ACTIVATED CARBON Ph.D. Thesis
Marcho Stefenov Kouyoumdjiev 1992 260 p
(ETN-93-94042) Avail: CASI HC A12/MF A03

The kinetics of adsorption in activated carbon are investigated and single solute kinetic parameters are used to describe (predict) multisolute kinetics. This is achieved by studying the overall rate of adsorption of several organic compounds from dilute aqueous solutions in granular activated carbon in a batch system with special focus on the dependence of diffusion inside the particle in initial organic compound(s) concentration, amount of carbon added, type of organic compound used, type of adsorption system (single or two solute) and particle size (for a limited number of experiments). Several mathematical models are developed and the simulation results are compared to experimental data. Three single solute systems (4-isopropylphenol, p-nitroaniline and nitrobenzene) and the combined two solutes systems (4-isopropylphenol/p-nitroaniline and nitrobenzene/p-nitroaniline) are used. These compounds were chosen because they are representative for pollutants occurring in industrial waste water streams and because their concentrations could be accurately measured by the analytical method used (UV spectrophotometry). ESA

N93-31603 National Physical Lab., Teddington (England). Materials Metrology Div.
DIFFUSION COEFFICIENTS IN MOLTEN SLAGS
K. C. Mills 1992 30 p
(NPL-DMM(A)-82; ETN-93-94034) Copyright Avail: Issuing Activity (National Physical Laboratory, Teddington, Middlesex, TW11 0LW, United Kingdom)

The theory and the experimental data concerning the diffusion coefficients in molten slags is reviewed. An overview of the self (tracer) impurity and chemical interdiffusion coefficients is provided. The theoretical approaches to investigate single component and multi-component diffusion are described. The influence of temperature, pressure, slag composition, radius, and valency of diffusing species on the diffusion coefficients are discussed. The relationship between diffusivity and viscosity and electrical conductivity are studied. ESA

N93-31622# Technische Univ., Eindhoven (Netherlands).
INTERACTIONS BETWEEN TETRAALKYLAMMONIUM IONS AND SILICATES Ph.D. Thesis
Jacques Cor Johan vanderDonck 1992 164 p
(ETN-93-94057) Avail: CASI HC A08/MF A02

In zeolite syntheses Tetraalkylammonium (TAA) ions are used as a template. The operation is based on specific interactions between the template and the precursor phase. In order to obtain insight in these interactions viscosity measurements were performed and coacervation in solutions of TAA and silicate ions and adsorption of TAA ions on silica were investigated. Introductions, theories, and conclusions for the following are presented: viscosity of silicate solutions; coacervation in aqueous solutions of TAA bromides and sodium silicate; and adsorption of TAA bromide on silica. ESA

N93-31630# Technische Univ., Eindhoven (Netherlands).
ISOTOPICALLY SELECTIVE DETECTION OF RUBIDIUM IN KRYPTON Ph.D. Thesis
Alexander Michael vanderSpek 1992 128 p
(ETN-93-94051) Avail: CASI HC A07/MF A02

Three different but strongly interrelated subjects are addressed, chosen to help solve some of the questions related to the very expensive production process of radio isotopes for medical imaging. The production of Rb-81 in high pressure krypton gas targets in particular was a driving force. A double resonance method was developed to selectively detect separate rubidium isotopes with high sensitivity in high pressure krypton gas. This double resonance technique circumvents the problem of pressure broadening by combining the high resolving power of microwave spectroscopy with the sensitivity offered by laser induced fluorescence. The double resonance method, however, is complicated enough to warrant research into a simple, self calibrating way of measuring absolute values of the density of a particular rubidium isotope. Absolute density measurements can then be used to check the double resonance results. In order to easily simulate the production process of rubidium isotopes in a krypton gas target, a rubidium source is called for that which is both stable under atmospheric conditions and capable of producing rubidium densities on the order of 10 to the 13th power/cu m in a reproducible way. Such a source was based upon a gold-rubidium compound. ESA

N93-31817# Department of Energy, Washington, DC. Chemical Sciences Div.
EXAM: A TWO-STATE THERMODYNAMIC ANALYSIS PROGRAM Final Report
W. H. Kirchhoff Feb. 1993 114 p Sponsored by National Inst. of Standards and Technology
(PB93-191658; NIST/TN-1401) Avail: CASI HC A06/MF A02

EXAM is a computer program written for the analysis of data from calorimetric or spectroscopic data on the denaturation of proteins, oligonucleotides, lipids and other macromolecules in terms of a two-state model of thermodynamic equilibrium. NTIS

N93-31824# Korean Atomic Energy Research Inst., Daeduk (Republic of Korea).
STUDY ON LASER ATOMIC SPECTROSCOPY
Jong Min Lee, Kyu Seok Song, Do Young Jeong, Chul Joong Kim, and Phil Soon Han Jan. 1992 235 p In KOREAN
(DE93-606193; KAERI/RR-1043/91) Avail: CASI HC A11/MF A03 (US Sales Only)

Electric discharge type atomic vaporizer is developed for the spectroscopic study on actinide elements. Laser induced fluorescence study on actinide elements is performed by using this high temperature type atomizer. For the effective photoionization of elements, copper vapor laser pumped dye laser and electron beam heating type atomic vaporizer are built and their characteristics are measured. In addition, resonance ionization mass spectroscopic analysis for lead sample as well as laser induced fluorescence study on uranium sample in solution phase is made. DOE

N93-31875# Advanced Fuel Research, Inc., East Hartford, CT.
ADVANCED INFRARED SPECTROSCOPY FOR IMPROVED CHARACTERIZATION OF CHEMICAL SYSTEMS Final Report
P. W. Morrison, M. D. Carangelo, J. R. Haigis, R. M. Carangelo, and P. R. Solomon 30 Sep. 1989 44 p See also DE87012827 Sponsored by NSF, Washington, DC
(Grant NSF ISI-88-60275)
(PB93-174977; NSF/ISI-89028) Avail: CASI HC A03/MF A01

The objective of the project is the development of a rugged, inexpensive, and sensitive sensor for the on-line analysis of process streams. The sensor will simultaneously measure the composition, concentration, and temperature of gases and particles in the stream. Phase sensitive detection is applied to Fourier Transform Infrared (FTIR) spectroscopy. Phase sensitive FTIR (PS-FTIR) employs a high frequency modulation and a lock-in amplifier to recover only IR absorptions associated with it. PS-FTIR reduces noise in the transmission spectrum of a turbulent flame by at least a factor of 30 and can detect the IR spectrum of a trace sample whose absorption is

modulated. Barriers currently preventing the application of PS-FTIR to a broad range of chemical problems appear to be surmountable. Phase 1 has defined a flexible research design equipped with different modulators and lock-in schemes. Depending on the experimental configuration, this PS-FTIR design can reject flicker noise produced by a scintillating sample, convert FT-IR from a line-of-sight spectroscopy into a spatially resolved one, and lower detection limits. NTIS

N93-31918# Brigham Young Univ., Provo, UT. Dept. of Chemistry.
THE EFFECT OF ALKYL SUBSTITUENTS ON THE MACROCYCLE RING ON ENANTIOMERIC RECOGNITION BY CHIRAL PYRIDINO-18-CROWN-6 FOR 1-NAPHTHYLETHYLAMINE
J. K. Hathaway, L.-Y. Zhu, P. Huszthy, J. S. Bradshaw, and R. M. Izatt 20 May 1993 15 p
(Contract N00014-91-J-1710)
(AD-A265513; TR-20) Avail: CASI HC A03/MF A01

This paper discusses the effect that various dialkyl substituents on chiral pyridino-18-crown-6 ligands have on the molecular recognition of these ligands for the (R) and (S)-(alpha-(1-naphthyl)ethyl) ammonium perchlorate. We have systematically synthesized the necessary chiral pyridino-18-crown-6 macrocycles and determined the extent of molecular recognition by titration calorimetry. This paper also discusses possible mechanisms of recognition. Author (DTIC)

N93-31919# Bowling Green State Univ., OH. Center for Photochemical Sciences.
VIBRATIONAL OVERTONE SPECTROSCOPY OF CYCLIC AMINES: PYRIDINE AND RELATED COMPOUNDS Technical Report
Joyce Overly and Deanne Snavely 27 May 1993 10 p
(Contract N00014-88-K-4130)
(AD-A265524; TR-13-ONR) Avail: CASI HC A02/MF A01

The vibrational overtone spectra of gaseous pyridine, 2,6-difluoropyridine, and pyrazole have been recorded using photoacoustic absorption spectroscopy. The pyridine overtone spectrum shows a progression of two peaks at each vibrational level. The widths of the overtone absorptions are compared to the known peak widths in the overtone spectrum of benzene. The spectrum has been analyzed in terms of a local mode model and, taken separately, the two peaks fit well to a Birge-Sponer plot. The v = 4 overtone spectrum of 2,6-difluoropyridine is similar to that of pyridine but the peaks are shifted to higher energy. The presence of two peaks in this spectrum refutes a previous assignment of the liquid pyridine overtone spectrum in which the two peaks were attributed to structurally different C-H oscillators in the molecule. The overtone spectrum of pyrazole also shows two peaks. DTIC

N93-31920# Rice Univ., Houston, TX. Dept. of Chemistry.
INFRARED SPECTROSCOPY OF HYDROGEN AND WATER ON DIAMOND (100)
L. M. Struck and M. P. DEvelyn 29 May 1993 11 p
(Contract N00014-91-J-1550)
(AD-A265531; TR-19-ONR) Avail: CASI HC A03/MF A01

The absorption of deuterium and water on diamond (100) has been investigated by infrared multiple-internal-reflection spectroscopy using a natural type 2a diamond internal reflection element. Evidence was seen for both monohydride surface species (CD deformation mode at 901/cm) and dihydride species (CD2 deformation mode at 1125/cm). Following exposure to water at elevated temperature, infrared modes were detected at 1280, 1200, 1125, 1080, and 720/cm, and are assigned to ether (C-O-C), hydroxyl (-OH), and carbonyl (=C=O) modes. The substantial observed reactivity of diamond with water indicates a potentially important role for surface hydroxyl and oxide species in diamond growth. Author (DTIC)

N93-32327 Wayne State Univ., Detroit, MI.
INNOVATIVE INSTRUMENT DESIGN AND APPLICATIONS IN SUPER-CRITICAL FLUID CHROMATOGRAPHY AND EXTRACTION Ph.D. Thesis
John Wayne Oudsema 1992 168 p
Avail: Univ. Microfilms Order No. DA9310700

A sample introduction system was developed for supercritical fluid chromatography. The solventless injector utilizes a gas purge for solvent elimination and is capable of handling large sample volumes. Successful operation depends on the difference in volatility between the solvent and the analyte along with effective refocusing mechanisms at the head of the column. Additionally, reduced analysis times are achieved by in-line derivatization to permit the separation of polar analytes and elimination of volatile reagents and by products. The construction of a SFC restrictor from a 2 mm metal disc was described using commercially available components. The design is compact, robust and will readily interface existing detectors. Preliminary results indicate that variable flow control can be achieved by temperature programming. Further studies are necessary to determine the feasibility of the designs potential as a variable flow restrictor. The Knox equation was useful in illustrating the limitations of the solventless injector during isochloric conditions and proved that small particle (less than 10 microns) columns packed by the supercritical fluid displacement method are identical to those packed by the high pressure slurry packing method developed for HPLC. Adverse thermodynamic effects from the column pressure drop results in a poor fit with theoretical models and difficulty in comparing different packing materials. Supercritical CO2 and microbore columns are compatible with GC style detectors (FID). The use of formamide as a modifier improves the chromatographic properties for compounds containing nitrogen atoms and is compatible with the FID. SFE/SFC with formic acid modified CO2, polymer encapsulated stationary phases and the FID represent a considerable advance in the analysis of organotin compounds. The method is capable of extracting and separating a diverse group of industrially important organotin compounds. Triorganotins were determined in marine paint, potatoes, almonds, and cation exchange resin. Diorganotin compounds were determined in PVC and cation exchange resin. The solventless injector allowed on line collection from the SFE cell and direct introduction to the analytical column. Dissert. Abstr.

N93-31272# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Flugabteilung.
THE DLR TEST AIRCRAFT IN THE FZ-BS, -VFW 614/ATTAS, DORNIER DO 228-101, MBB BO105 S-3
Hans-L. Meyer *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 6-30 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 9-34 Original language document was announced as N92-25591 (For primary document see N93-31271 12-04)
Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N93-31093# International Centre for Theoretical Physics, Trieste (Italy).
LOCAL ORDER AND CONCENTRATION FLUCTUATIONS IN K-Pb AND Rb-Pb ALLOYS
O. Akinlade Aug. 1992 21 p
(DE93-606725; IC-92/205) Avail: CASI HC A03/MF A01 (US Sales Only)

The concentration fluctuations in the long wavelength limit S(sub CC)(0), short range order parameter, and free energy of mixing of K-Pb and Rb-Pb alloys have been studied within the framework of the quasi-chemical theory. It is observed that the simple model could be used to shed more insight into the nature of chemical ordering that exists in such strongly compound forming binary alloys. DOE

N93-31184# Oak Ridge Y-12 Plant, TN.
THE KINETICS OF THE HYDRIDING OF URANIUM METAL 2
G. L. Powell, R. N. Ceo, W. L. Harper, and J. R. Kirkpatrick (Oak Ridge K-25 Site, TN.) 29 Sep. 1992 5 p
(Contract DE-AC05-84OS-21400)
(DE93-004766; Y/DZ-836/R3) Avail: CASI HC A01/MF A01 (US Sales Only)

The hydriding rate of well annealed uranium is calculated by computer program. The program requests input of temperature in degrees centigrade and pressure in Pascals, and returns these values along with corresponding hydriding rates in millimoles H atoms per square meter per second, hydriding

velocity in nanometers per second, the time to first spall, the terminal hydriding yield (1 - U(sub stop)), the plateau pressure, the permeability, the microscopic hydriding rate, the solubility, and the diffusivity. DOE

N93-31192# McDonnell-Douglas Electronics Co., Saint Louis, MO.
USE OF TITANIUM CASTINGS WITHOUT A CASTING FACTOR Final Report, 26 Sep. 1989 - 30 Sep. 1992
Dianne Chong 30 Sep. 1992 131 p
(AF Proj. 2418)
(AD-A264414; WL-TR-92-4090) Avail: CASI HC A07/MF A02

The 'Use of Titanium Castings Without a Casting Factor' program was conducted to establish 'A' and 'B' allowables for Ti-6Al-4V. Taguchi methods were used to develop a more restrictive chemistry and annealing condition to provide parts with less variability in properties. 'A' and 'B' design allowables that were determined for full scale Ti-6Al-4V missile fins and step plates produced using these new parameters showed very low variability, the standard deviations of these data were less than 2 ksi. The 'A' basis allowables are F(sub tu) = 125 ksi and F(sub ty) = 120 ksi. A nondestructive inspection technique was developed to correlate measurement of microstructural features to mechanical properties. This was found to be of limited value because of the narrow property band that was established. A new AMS specification that included the new allowables, the microstructural inspection criteria, and the more refined chemistry and post-casting treatments was established for investment cast Ti-6Al-4V. Limited fracture mechanics evaluation was also performed on the cast fins. DTIC

N93-31294*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
PLASMA SPRAYED CERAMIC THERMAL BARRIER COATING FOR NiAl-BASED INTERMETALLIC ALLOYS Patent Application
R. A. Miller, inventor (to NASA) and J. Doychak, inventor (to NASA) 26 Oct. 1992 10 p
(NASA-Case-LEW-15535-1; NAS 1.71:LEW-15535-1;
US-Patent-Appl-SN-970669) Avail: CASI HC A02/MF A01

A thermal barrier coating system consists of two layers of a zirconia-yttria ceramic. The first layer is applied by low pressure plasma spraying. The second layer is applied by conventional atmospheric pressure plasma spraying. This facilitates the attachment of a durable thermally insulating ceramic coating directly to the surface of a highly oxidation resistant NiAl-based intermetallic alloy after the alloy has been preoxidized to promote the formation of a desirable Al2O3 scale. NASA

N93-31321 National Physical Lab., Teddington (England). Materials Metrology Div.
VISCOSITIES OF MOLTEN SLAGS
K. C. Mills Feb. 1992 117 p
(NPL-DMM(A)-55; ETN-93-93742) Copyright Avail: Issuing Activity
(National Physical Lab., Teddington, Middlesex, TW11 0LW, England)

Viscosity data for slag systems are collated, and recommended values are given for most systems. The ability of two mathematical models to estimate viscosities of various types of multicomponent industrial slags was checked. ESA

N93-31322 National Physical Lab., Teddington (England). Materials Metrology Div.
THERMAL CONDUCTIVITIES OF SLAGS
K. C. Mills and M. Susa Apr. 1992 31 p Sponsored by Ministry of Education, Science and Culture, Sagamihara, Japan
(NPL-DMM(A)-68; ETN-93-93743) Copyright Avail: Issuing Activity
(National Physical Lab., Teddington, Middlesex, TW11 0LW, England)

The thermal conductivity data for solid and molten slags are collated and evaluated. Thermal conduction mechanisms are described: lattice or 'phonon' thermal conductivity; radiation conductivity; and electronic conductivity. The experimental methods described are steady state techniques, nonsteady state methods, and transient methods. ESA

N93-31324 National Physical Lab., Teddington (England). Materials Metrology Div.
ELECTRICAL CONDUCTIVITIES OF MOLTEN SLAGS
K. C. Mills Aug. 1992 76 p
(NPL-DMM(A)-79; ETN-93-93745) Copyright Avail: Issuing Activity
(National Physical Lab., Teddington, Middlesex, TW11 0LW, England)

Methods used for measuring specific electrical conductivities are outlined, and values of the conductivities of molten slags are collated and evaluated. Recommended values are given. ESA

N93-31540# Technische Univ., Eindhoven (Netherlands).
WEB CRIPPLING OF COLD-FORMED STEEL MEMBERS Ph.D. Thesis
Monica Catherina Mar Bakker 1992 341 p Sponsored by Netherlands Technology Foundation, and Centrum Staal, Netherlands
(ISBN-9-03-860122-0; ETN-93-94048) Copyright Avail: CASI HC A15/MF A03

The findings of a research project on web crippling of cold formed flexural steel members are reported. The object was to develop an analytical model for describing the load deformation behavior of members subjected to the combined action of a concentrated load and a bending moment, to be used in the development of more reliable design rules. A test set up was designed to perform deformation controlled web crippling tests. In these tests, besides the loads, the web crippling deformation, the mid span deflection, and the rotation at the end supports were measured. A test program was developed to enable the determination of the various parameters on the web crippling behavior. From the experimental research it was concluded that cold formed hat sections, subjected to the combined action of a concentrated load and bending moment, may fail by two different types of web crippling failure modes: the yield arc mechanisms occurring in members with small corner radii, and the rolling mechanism occurring in members with large corner radii. In three tests, an asymmetrical failure mode was observed which might be caused by the attainment of the ultimate bending moment resistance. ESA

N93-31602 National Physical Lab., Teddington (England). Materials Metrology Div.
CORROSION-EROSION OF ALLOYS EXPOSED IN FLUIDISED BED COMBUSTORS Final Report
D. J. Hall and S. R. J. Saunders Sep. 1992 23 p
(NPL-DMM(A)-80; ETN-93-94033) Copyright Avail: Issuing Activity
(National Physical Laboratory, Teddington, Middlesex, TW11 0LW, United Kingdom)

The objectives of the work were: to study corrosion-erosion phenomena in laboratory rigs; to compare morphology of specimen surfaces with testpieces exposed in working Fluidized Bed Combustors (FBC's); the mechanisms involved; and to determine the important characteristics of oxide scales which control metal loss rates. The experiments were carried out with mild steel and a range of chromium containing ferritic and austenitic steels in a slumped bed erosion rig. Microhardness values of typical oxide scales grown in different atmospheres were measured. The results correlated with those obtained from scales formed in tubes exposed in the 4MW TNO AFBC at Apeldoorn. Strain to failure of surface oxide grown in mild steel was measured using acoustic emission to detect the occurrence of cracks during 4 point bend tests carried out at room temperature. For all steels wear increased with increasing temperature until a maximum was reached, thereafter as protection was conferred by the oxide scale rates of wear decreased. The temperature at which this maximum occurred increased with the chromium content of the steel from 275 C for mild steel to 475 C for 310 stainless steel. Hardness of the inner layer of the oxide scales also increased with chromium content of the oxide. A good correlation between strain to failure for oxides of different thickness on mild steel and model predictions was obtained when cooling strain from growth to room temperature was taken into account. ESA

N93-31643*# Virginia Univ., Charlottesville. School of Engineering and Applied Science.
NASA-UVa LIGHT AEROSPACE ALLOY AND STRUCTURE TECHNOLOGY PROGRAM SUPPLEMENT: ALUMINUM-BASED MATERIALS FOR HIGH SPEED AIRCRAFT Report, 1 Jan. - 30 Jun. 1992
E. A. Starke, Jr. Washington Jun. 1993 226 p
(Grant NAG1-745; RTOP 763-23-45-86)
(NASA-CR-4517; NAS 1.26:4517) Avail: CASI HC A11/MF A03

This report on the NASA-UVa Light Aerospace Alloy and Structure Technology Program Supplement: Aluminum-Based Materials for High Speed Aircraft covers the period from January 1, 1992 to June 30, 1992. The objective of the research is to develop aluminum alloys and aluminum matrix composites for the airframe which can efficiently perform in the

HSCT environment for periods as long as 60,000 hours (certification for 120,000 hours) and, at the same time, meet the cost and weight requirements for an economically viable aircraft. Current industry baselines focus on flight at Mach 2.4. The research covers four major materials systems: (1) ingot metallurgy 2XXX, 6XXX, and 8XXX alloys, (2) powder metallurgy 2XXX alloys, (3) rapidly solidified, dispersion strengthened Al-Fe-X alloys, and (4) discontinuously reinforced metal matrix composites. There are ten major tasks in the program which also include evaluation and trade-off studies by Boeing and Douglas aircraft companies. Author (revised)

N93-31646*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

AN INVESTIGATION OF SQUEEZE-CAST ALLOY 718

W. R. Gamwell Jun. 1993 50 p

(CDDF Proj. 90-10)

(NASA-TM-108412; NAS 1.15:108412) Avail: CASI HC A03/MF A01

Alloy 718 billets produced by the squeeze-cast process have been evaluated for use as potential replacements for propulsion engine components which are normally produced from forgings. Alloy 718 billets were produced using various processing conditions. Structural characterizations were performed on 'as-cast' billets. As-cast billets were then homogenized and solution treated and aged according to conventional heat-treatment practices for this alloy. Mechanical property evaluations were performed on heat-treated billets. As-cast macrostructures and microstructures varied with squeeze-cast processing parameters. Mechanical properties varied with squeeze-cast processing parameters and heat treatments. One billet exhibited a defect free, refined microstructure, with mechanical properties approaching those of wrought alloy 718 bar, confirming the feasibility of squeeze-casting alloy 718. However, further process optimization is required, and further structural and mechanical property improvements are expected with process optimization. Author (revised)

N93-31660# Academy of Sciences of the Ukraine, Kiev. Inst. Yadernykh Issledovanij.

ELECTRON-MICROSCOPIC INVESTIGATIONS OF IRRADIATED AND NATURALLY AGED ALUMINUM ALLOY

V. N. Drobyazin, S. P. Polovneva, Yu. S. Podzirej, and G. A. Soldatenko 1991 9 p In RUSSIAN

(DE93-606752; KIYal-91-9) Avail: CASI HC A02/MF A01 (US Sales Only)

The decay kinetics of solid solution, irradiated and naturally aged alloy of Al-Cu-Mg-Mn system was investigated by the method of transmission electron microscopy. It was shown that in irradiated and natural aged alloy the decay of solid solution proceeds in other mechanism than in non-irradiated one. As a result of irradiation the multilayer dislocation loops of interstitial nature, which serves as discharges for impurity atoms and the center of metastable phase S' and Theta'. It was shown that it promotes to form the more homogeneous and uniform structure of alloy that in one's turn improve the mechanical alloy properties. DOE

N93-31739*# Virginia Univ., Charlottesville. Dept. of Materials Science and Engineering.

NASA-UVA LIGHT AEROSPACE ALLOY AND STRUCTURES TECHNOLOGY PROGRAM (LA2ST) Progress Report, 1 Jan. - 30 Jun. 1993

Richard P. Gangloff, John R. Scully, Glenn E. Stoner, Earl A. Thornton, Franklin E. Wawner, Jr., and John A. Wert 20 Jul. 1993 441 p

(Grant NAG1-745)

(NASA-CR-193412; NAS 1.26:193412; UVA-528266-MS-94-113) Avail: CASI HC A19/MF A04

The NASA-UVA Light Aerospace Alloy and Structures Technology (LA2ST) Program continues a high level of activity. Progress achieved between 1 Jan. and 30 Jun. 1993 is reported. The objective of the LA2ST Program is to conduct interdisciplinary graduate student research on the performance of next generation, light weight aerospace alloys, composites, and thermal gradient structures in collaboration with NASA-Langley researchers. The following projects are addressed: environmental fatigue of Al-Li-Cu alloys; mechanisms of localized corrosion and environmental fracture in Al-Cu-Li-Mg-Ag alloy X2095 and compositional variations; the effect of zinc additions on the precipitation and stress corrosion cracking behavior of alloy 8090; hydrogen interactions with Al-Li-Cu alloy 2090 and model alloys; metastable pitting of aluminum alloys; cryogenic fracture toughness of Al-Cu-Li + In alloys; the fracture toughness of Weldalite (TM); elevated temperature cracking of advanced I/M aluminum alloys; response of Ti-1100/SCS-6 composites to thermal exposure; superplastic forming of Weldalite (TM); research to incorporate environmental effects into fracture mechanics fatigue life prediction codes such as NASA FLAGRO; and thermoviscoplastic behavior. Derived from text

N93-31795 Pratt and Whitney Aircraft, West Palm Beach, FL. Government Engines and Space Propulsion.

FATIGUE IN SINGLE CRYSTAL NICKEL SUPERALLOYS Technical Progress Report, 16 Apr. - 15 May 1993

Daniel P. DeLuca and Charles Annis 15 May 1993 6 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract N00014-91-C-0124)

(AD-A265451; PW/GESP-FR21998-19) Avail: CASI HC A02

This program investigates the seemingly unusual behavior of single crystal airfoil materials. The fatigue initiation processes in single crystal (SC) materials are significantly more complicated and involved than fatigue initiation and subsequent behavior of a (single) macrocrack in conventional, isotropic, materials. To understand these differences, it is helpful to review the evolution of high temperature airfoils. Modern gas turbine flight propulsion systems employ single crystal materials for turbine airfoil applications because of their superior performance in resisting creep, oxidation, and thermal mechanical fatigue (TMF). These properties have been achieved by composition and alloying, of course, but also by appropriate crystal orientation and associated anisotropy. DTIC

N93-31827# Korean Atomic Energy Research Inst., Daeduk (Republic of Korea).

STUDY ON THE IMPROVEMENT OF THE PROPERTIES OF Zr ALLOYS

Young Suk Kim, Jung Ho Han, Yong Hwan Jeong, Duk Hyun Lee, Gi Sung Park, Jun Hwa Hong, Ji Yun Park, and Gae Ho No Jan. 1992 143 p

(DE93-605265; KAERI/RR-1079/91) Avail: CASI HC A07/MF A02 (US Sales Only)

The objective is to develop the corrosion resistant zirconium base alloys. In order to achieve this goal, this year's activities have focused on the guidelines for the corrosion resistant zirconium alloy design, the manufacturing of the sheets of zirconium base alloys, and finally the characterization of the NAZA's (New Alternate Zirconium Alloys). The main results from this study can be summarized as follows: based on the evaluation of the role of alloying elements, i.e., Nb, Sn, Fe, Cr, and etc, as many as 23 different kinds of the NAZA's were preliminarily designed; the 3 kinds of NAZA's-Lot 15, 22, and 23 manufactured into a sheet through a series of manufacturing procedures; and the microstructures, hardness, and the corrosion performances of 3 kinds of NAZA's were investigated. DOE

N93-32296# Lawrence Livermore National Lab., CA.

SINGLE CRYSTAL TUNGSTEN KINETIC ENERGY PENETRATORS

C. F. Cline and R. P. Gogolewski May 1992 16 p Presented at the 13th International Symposium on Ballistics, Stockholm, Sweden, 1-3 Jun. 1992

(Contract W-7405-eng-48)

(DE93-012570; UCRL-JC-107113; CONF-920689-6) Avail: CASI HC A03/MF A01

We have explored the terminal ballistic performance of single crystal tungsten as a kinetic energy penetrator. Scientific speculation as to the anticipated penetration performance and nature of the interaction between such a kinetic energy penetrator and semi-infinite and spaced metallic targets has led us to perform laboratory scale experiments and metallographic examinations of post-impact penetrator materials. The single tungsten crystals were ground into kinetic energy penetrators with the (111) and (100) crystal direction being coincident with the axis of symmetry of the penetrators. The crystals were electro-polished to their final diameter. We compared the terminal performance at current ordnance speeds of (111) single crystal tungsten to 90W-10 (NiFe) cemented tungsten and textured pure tungsten in laboratory scale ballistic experiments against a spaced steel (triple) target at sixty-five degrees obliquity. We also compared the terminal performance of (100) and (111) single crystal tungsten with 90W-10 and 98W02 (NiFe) cemented tungsten and textured pure tungsten

in laboratory scale ballistic experiments against monolithic 4340 alloy steel (HRC = 36) at normal impact. We radiographed the penetrators during the interactions with the targets, we recovered portions of the penetrators after the ballistic experiments, and we conducted metallographic examinations of penetrator remnants. From the radiographic records and the metallographic examinations, we drew conclusions pertaining to insights into the terminal interactions of the penetrators with the targets and suggestions as to improved compositions of the cemented tungsten penetrators. DOE

N93-32302# Oak Ridge National Lab., TN.
DETECTION OF RADIATION-INDUCED CHANGES IN ELECTROCHEMICAL PROPERTIES OF AUSTENITIC STAINLESS STEELS USING MINIATURIZED SPECIMENS AND THE SINGLE-LOOP ELECTROCHEMICAL POTENTIOKINETIC REACTIVATION METHOD
T. Inazumi (NKK Industries, Tokyo, Japan.), G. E. C. Bell, E. A. Kenik, and K. Kiuchi (Japan Atomic Energy Research Inst., Tokai.) Jan. 1993 64 p
(Contract DE-AC05-84OR-21400)
(DE93-012865; ORNL/TM-12094) Avail: CASI HC A04/MF A01

Single-loop electrochemical potentiokinetic reactivation testing of miniaturized (TEM) specimens can provide reliable data comparable to data obtained with larger specimens. Significant changes in electrochemical properties (increased reactivation current and Flade potential) were detected for PCA and type 316 stainless steels irradiated at 200-420 C up to 7-9 dpa. Irradiations in the FFTF Materials Open Test Assembly and in the Oak Ridge Research Reactor are reported. DOE

N93-32318# Materials and Electrochemical Research Corp., Tucson, AZ.
THE DEVELOPMENT OF A TUNGSTEN HEAVY ALLOY THAT FAILS BY AN ADIABATIC SHEAR MECHANISM, PHASE 1 Final Report, 1 Jan. - 30 Sep. 1992
Sumit Guha, Christos Kyriacou, James C. Withers, and Raouf O. Loutfy Apr. 1993 120 p
(Contract DAAL04-92-C-0009)
(AD-A265867; ARL-CR-56) Avail: CASI HC A06/MF A02

Kinetic Energy penetrators made from Depleted Uranium (DU) alloys have consistently performed better than equi-density and geometrically similar penetrators made from conventional tungsten heavy alloys (WHA) during ballistic penetration tests into semi-infinite Rolled Homogeneous Armor (RHA) steel targets. The superior penetration behavior of DU penetrators is presently attributed to these penetrators maintaining a 'chisel' nose by failure along adiabatic shear bands which is in contrast to the 'mushroom' head observed in WHA penetrators; the 'mushroom' head decreases the energy density at the target thereby leading to reduced penetration. The radiological hazard of DU combined with chemical corrosion during storage provides an impetus to improving the state-of-the-art in WHA with respect to ballistic penetration behavior. Interestingly, WHA penetrators with DU matrix (instead of the conventional Ni-Fe, Ni-Co, or Ni-Fe-Co matrices) also fail by adiabatic shear indicating that shear localization is probably influenced greatly by matrix material properties. Hence, an investigation into alternative matrix materials for WHA that will support shear localization is warranted. DTIC

N93-32385# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
ACCELERATED AND REAL-TIME CORROSION TESTING OF ALUMINUM-LITHIUM ALLOYS
L. Schra 30 May 1991 11 p Presented at the 6th International Aluminum-Lithium Conference, Garmisch-Partenkirchen, Germany, 7-11 Oct. 1991
(NLR-TP-91203-U; ETN-93-94061; AD-B168789L) Avail: CASI HC A03/MF A01

Aluminum-lithium (Al-Li) alloys are potentially attractive for aerospace structures. These alloys combine low density and high stiffness. Al-Li alloy development may be considered successful if other properties are maintained with respect to conventional alloys. Experimental programs were conducted to evaluate the engineering properties of Al-Li alloys and to explain their characteristic behavior. The corrosion and stress corrosion properties were initially assessed from accelerated laboratory tests. Atmospheric exposure tests were also done to investigate behavior in an environment closer to that of an aircraft, and to check whether laboratory tests give realistic predictions for these new materials. The laboratory and atmospheric exposure results are discussed. ESA

N93-31576*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THE EFFECT OF POROSITY AND GAMMA-GAMMA' EUTECTIC CONTENT ON THE LOW CYCLE FATIGUE BEHAVIOR OF HYDROGEN-CHARGED PWA-1480
John Gayda, Robert L. Dreshfield, and Timothy P. Gabb *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 179-185 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

N93-31578*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
SECONDARY ORIENTATION EFFECTS IN A SINGLE CRYSTAL SUPERALLOY UNDER MECHANICAL AND THERMAL LOADS
Sreeramesh Kalluri (Sverdrup Technology, Inc., Brook Park, OH.), Ali Abdul-Aziz (Sverdrup Technology, Inc., Brook Park, OH.), and Michael A. McGaw *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 197-206 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

N93-31582*# Army Aviation Systems Command, Cleveland, OH.
AXIAL AND TORSIONAL FATIGUE BEHAVIOR OF A COBALT-BASE ALLOY
Peter J. Bonacuse and Sreeramesh Kalluri (Sverdrup Technology, Inc., Brook Park, OH.) *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 239-246 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

For composite materials see *24 Composite Materials.*

N93-31047# Technische Univ., Brunswick (Germany). Fakultaet fuer Maschinenbau und Elektrotechnik.
DEVELOPMENT OF TECHNICAL PROCESSES FOR MANUFACTURING HEAVY METAL FLUORIDE GLASS FIBERS Ph.D. Thesis [ENTWICKLUNG TECHNISCHER PROZESSE ZUR HERSTELLUNG VON SCHWERMETALLFLUORIDGLAS-FASERN]
Axel Kober 1992 181 p In GERMAN
(ETN-93-94200) Avail: CASI HC A09/MF A02

Properties and technology advances of heavy metal fluoride glass fibers are reviewed. Differential scanning calorimetry and thermomechanical analysis are described for crystallization stability examination. Instruments and processes for chalcogenide fiber fabrication are depicted, such as drying and impurity removal by sublimation of starting materials, and extraction of fluorides from organic solutions. A process for fluorination of zirconium hydroxide by NH4HF2 in a melting furnace are presented. Characteristics of the furnace atmosphere, temperature regulation, and the crucible were given, which are necessary for glass fabrication. Examples of preform manufacturing with glass kernel and plastics mantle are presented. Influences of indium on fiber stability, viscosity, thermal expansion coefficient, and dilatation of fibers are studied. ESA

N93-31066# Missouri Univ., Rolla. Dept. of Chemistry.
NMR STUDIES OF ORGANIC THIN FILMS Technical Report, Jun. 1990 - 1993
Frank D. Blum 15 May 1993 73 p
(Contract N00014-91-J-1274)
(AD-A264903; UMR-FDB-31) Avail: CASI HC A04/MF A01

A review with 200 references on NMR, and some ESR, studies of organic thin films is presented. Additionally, a general background and sections on the following are given: polymers at interfaces (solid-liquid,

elastomer-solid, solid-gas, and solid-solid systems); and surface active agents (bonded and non-bonded phases). DTIC

N93-31089# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TETRAGONAL ZIRCONIA CERAMICS IN Zr O2-Ce O2 SYSTEM (Cp): PREPARATION, CHARACTERIZATION, AND MECHANICAL PROPERTIES [CERAMICAS DE ZIRCONIA TETRAGONAL POLICRISTALINA NO SISTEMA ZR O2-CE O2 (CE-TZP): PREPARACAO, CARACTERISTICAS E PROPRIEDADES MECANICAS]
M. C. deAndradeNono 1992 11 p In PORTUGESE Presented at the 36th Brazilian Congress on Ceramic, Caxambu, Brazil, 7 Jun. 1992
(DE93-606833; INPE-5372; CONF-9206287; PRE-1746) Avail: CASI HC A03/MF A01 (US Sales Only)

This paper describes and discusses the results achieved in a study about Ce-TZP ceramics prepared from conventional powder mixtures of ZrO2 and CeO2 (with composition in the range of 8 to 16 mol% CeO2). Physical and chemical characteristics were related with the powder compaction behavior and with the sintering state. The sintered ceramics showed a level of high porosity (approximately equal to 4%), mainly due to the fairly adequate powder characteristics and compaction. The crystalline phases were analyzed from X-rays diffraction data and showed that these ceramics can present tetragonal-to-monoclinic stress induced transformation. The bending strength, fracture toughness, and Vickers hardnessresults were influenced by CeO2 content microstructure and sintering temperature. These Ce-TZP ceramics showed mechanical strength results comparable to those published in the international literature. DOE

N93-31134 Pennsylvania State Univ., University Park.
COMPUTER SIMULATION OF 3D MATERIAL MICROSTRUCTURE AND ITS APPLICATION IN THE DETERMINATION OF MECHANICAL BEHAVIOR OF POLYCRYSTALLINE MATERIALS AND ENGINEERING STRUCTURES Ph.D. Thesis
Susmit Kumar 1992 357 p
Avail: Univ. Microfilms Order No. DA9311671

Voronoi tessellation has been used to simulate topologically equivalent microstructures for materials in three dimensions having random shape and size constituents. A complete statistical description of the topological and size properties of a cellular microstructure generated by a three-dimensional Poisson-Voronoi tessellation has been obtained by a rigorous computer simulation involving hundreds of thousands of cells. It has been found that a two-parameter gamma distribution gives an accurate fit to the distribution of faces, volumes, and surface areas of the cells. A finite element package (pre- and postprocessors) has been developed to use the Voronoi tessellation model to determine the effective elastic moduli of the polycrystalline materials. The effective elastic moduli predicted by the model always fall within the Voigt and Reuss limits. The calculated elastic moduli deviate between the Voigt and Reuss values systematically with the anisotropy of the single crystal. It has been found that the stress concentration at the grain boundary affects the elastic moduli of the polycrystalline material. The effect of random shape and size voids on the elastic moduli of alumina has also been determined. The model has been used to study the transient thermal stresses in a multilayer capacitor assuming anisotropy of the ceramic. Dissert. Abstr.

N93-31174# Melbourne Univ., Parkville (Australia). School of Physics.
CARBON DIFFUSION IN UNCOATED AND TITANIUM NITRIDE COATED IRON SUBSTRATES DURING MICROWAVE PLASMA ASSISTED CHEMICAL VAPOR DEPOSITION OF DIAMOND
P. S. Weiser, S. Prawer, A. Hoffman, R. R. Manory, P. J. K. Paterson, and Sue-Anne Stuart 1992 14 p
(DE93-608934; UM-P-92/23) Avail: CASI HC A03/MF A01 (US Sales Only)

Auger Electron Spectroscopy has been employed to investigate the effectiveness of thin films of TiN as barriers to carbon diffusion during Chemical Vapor Deposition (CVD) of diamond onto Fe substrates. Auger Depth Profiling was used to monitor the C concentration in the TiN layer, through the interface and into the substrate both before and after CVD diamond deposition. The results show that a layer of TiN only 250 A thick is sufficient to inhibit soot formation on the Fe surface and C diffusion into the Fe bulk. DOE

N93-31177# Melbourne Univ., Parkville (Australia). School of Physics.
THERMODYNAMIC ANALYSIS OF PROCESSES PROCEEDING ON (111) FACES OF DIAMOND DURING CHEMICAL VAPOUR DEPOSITION
W. Piekarczyk and S. Prawer 1992 17 p
(DE93-609039; UM-P-92/06) Avail: CASI HC A03/MF A01 (US Sales Only)

Chemically vapor deposited diamond is commonly synthesized from activated hydrogen-rich, carbon/hydrogen gas mixtures under conditions which should, from a thermodynamic equilibrium point of view, favor the production of graphite. Much remains to be understood about why diamond, and not graphite, forms under these conditions. However, it is well known that the presence of atomic hydrogen is crucial to the success of diamond deposition. As part of an attempt to better understand the deposition process, a thermodynamic analysis of the process was performed on diamond (111) faces in hydrogen rich environments. It is shown that the key role of atomic hydrogen is to inhibit the reconstruction of the (111) face to an sp2-bonded structure, which would provide a template for graphite, rather than diamond formation. The model correctly predicts experimentally determined trends in growth rate and diamond film quality as a function of methane concentration in the stating gas mixture. DOE

N93-31178# Melbourne Univ., Parkville (Australia). School of Physics.
INVESTIGATION OF CARBON NEAR THE GRAPHITE-DIAMOND-LIQUID TRIPLE POINT
S. Prawer, D. N. Jamieson, and R. Kalish 1992 14 p
(DE93-609052; UM-P-92/30) Avail: CASI HC A03/MF A01 (US Sales Only)

Pulsed laser irradiation is used to heat deeply buried damage layers in diamond. Over a small range of laser powers, damage annealing, formation of buried graphitic layers, and melting of diamond followed by its conversion upon cooling into graphite are observed. The diagnostics employed are channeling contrast microscopy, optical absorption, surface profilometry, and scanning and optical microscopies. The results are explained in terms of the behavior of carbon under high internal pressures close to the diamond-graphite-liquid carbon triple point in the phase diagram. DOE

N93-31179# Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil).
CHEMICAL EFFECTS OF IONIZING RADIATIONS AND ELECTRON BEAM IN POLYMERS: INDUSTRIAL USES
M. C. R. Yamasaki, R. V. V. DosReis, and E. P. Araujo 1991 5 p Presented at the 1st Brazilian Conference on Polymers, Sao Paulo, Brazil, 5-7 Nov. 1991
(DE93-609337; INIS-BR-3108; CONF-9111280) Avail: CASI HC A01/MF A01 (US Sales Only)

The results obtained from the development PVC dose indicator films, from the PE and PP hydrophilization, and from the formulations of crosslink able resins and curable inks and varnishes by radiation are discussed. DOE

N93-31211# Gas Research Inst., Chicago, IL.
GRI PROCEEDINGS ON THE WORKSHOP ON PLASTIC PIPE RESEARCH RESULTS
Oct. 1992 363 p Conference held in Chicago, IL, 30 Sep. - 1 Oct. 1992
(PB93-190460; GRI-92/0354) Avail: CASI HC A16/MF A03

The technical approach adopted in conducting this research project consisted of: Examining experimentally the conditions under which flow stoppage occurs; Subjecting PE pipe to squeeze-off under different conditions in order to evaluate the parametric effect of process conditions; Examining the squeezed-off pipe for damage; and Formulating a phenomenological model to explain the experimental results. Based on the measured data and the analytical results, guidelines for good squeeze-off practice were developed. The paper presents the findings of an extensive database for squeeze off flow control and damage studies. NTIS

N93-31300*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
OXIDATION RESISTANT OVERLAY COATINGS FOR LOW EXPANSION SUBSTRATES Patent Application
W. J. Brindley, inventor (to NASA), R. A. Miller, inventor (to NASA), J. L. Smialek, inventor (to NASA), and C. J. Rouge, inventor (to NASA) 29

Jun. 1993 18 p
(NASA-Case-LEW-15154-2; NAS 1.71:LEW-15154-2;
US-Patent-Appl-SN-083246) Avail: CASI HC A03/MF A01

A low thermal expansion oxidation resistant coating utilizes an oxidation resistant alloy and an inert low thermal expansion phase which act to reduce overall thermal expansion. This coating is prepared by mixing powders of an MCrAlX material with a sufficient quantity of powders of an inert low thermal expansion phase ceramic material to reduce the aggregate coefficient of thermal expansion of the resulting mixture to about that of the substrate. The coating is applied by a powder based coating process. NASA

N93-31316*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ION EXCHANGE POLYMERS AND METHOD FOR MAKING Patent Application
Warren H. Philipp, inventor (to NASA) and Kenneth W. Street, Jr., inventor (to NASA) 21 Jun. 1993 13 p
(NASA-Case-LEW-15576-1; NAS 1.71:LEW-15576-1;
US-Patent-Appl-SN-081910) Avail: CASI HC A03/MF A01

An ion exchange polymer comprised of an alkali metal or alkaline earth metal salt of a poly(carboxylic acid) in a poly(vinyl acetal) matrix is described. The polymer is made by treating a mixture made of poly(vinyl alcohol) and poly(acrylic acid) with a suitable aldehyde and an acid catalyst to cause acetalization with some cross-linking. The material is then subjected to an alkaline aqueous solution of an alkali metal salt or an alkali earth metal salt. All of the film forming and cross-linking steps can be carried out simultaneously, if desired. NASA

N93-31323 National Physical Lab., Teddington (England). Materials Metrology Div.
SURFACE DEGRADATION OF POLYMERIC MATERIALS
J. White (Newcastle-upon-Tyne Univ., England.) and A. Turnbull Aug. 1992 62 p
(NPL-DMM(A)-75; ETN-93-93744) Copyright Avail: Issuing Activity
(National Physical Lab., Teddington, Middlesex, TW11 0LW, England)

A review of surface degradation of polymeric materials exposed to natural and artificial weathering environments is reported. Mechanisms of degradation are discussed; the role of different environmental variables is evaluated; and methods of characterizing degradation in relation to changes in chemical, physical, and mechanical properties are described. Accelerated degradation under artificial weathering can often allow prediction of the ranking of polymer compounds under natural conditions, but reliable methods for lifetime prediction have not yet been developed. Depth profiling of chemical, physical, and mechanical properties as a function of exposure period and depth is a key factor in quantifying the rate of degradation but must be correlated with macroscopic measures of material performance. Predictive modeling of the rate of degradation based on the mechanisms of the processes involved is limited by the inherent complexity of the system. Empirical models based on time-temperature-dose rate superposition depend on the assumption of the same rate controlling factors over the range of environmental conditions and have had some partial success for specific systems but cannot be generalized. ESA

N93-31520# Technische Univ., Eindhoven (Netherlands).
LIQUID-CRYSTALLINE MAIN-CHAIN POLYMERS WITH FLEXIBLE SIDE CHAINS: SYNTHESIS, STRUCTURE, PROCESSING AND PROPERTIES OF POLY(P-PHENYLENE TEREPHTHALATE)S WITH ALKOXY SIDE CHAINS Ph.D. Thesis
Sabastiaan Bernardus Damman 1992 129 p Sponsored by TNO Plastics and Rubber Research Inst., Delft, Netherlands; DSM/NV Nederlandse Staatsmijnen, Geleen, Netherlands; and Ministry of Economic Affairs, Netherlands
(ETN-93-94041) Avail: CASI HC A07/MF A02

The mechanical properties of melt processable rigid polymers, obtained by the attachment of flexible aliphatic side chains to the rigid (p-phenylene terephthalate) backbone, are evaluated. The complex relations between molecular structure, crystal structure, phase behavior, processing, and relaxational behavior, are reported. To investigate the influence of the place and length of alkoxy substituents, four different polymers were studied: two with dodecyloxy and hexyloxy side chains in the terephthalate moiety; a polymer with dodecyloxy side chains in the hydroquinone moiety; and a polymer with a double amount of side chains. ESA

N93-31541# Technische Univ., Eindhoven (Netherlands).
ZIRCONIA CERAMICS AND MECHANICAL SURFACE INTERACTIONS Ph.D. Thesis
Paul Hendrik Jacob vandenBerg 1992 174 p
(Grant IOP-TK-90A211)
(ETN-93-94049) Avail: CASI HC A08/MF A02

A study to obtain some understanding about the influence of mechanical surface interactions, grinding and wear, on zirconia ceramics, is presented. Most of the study was performed on Mg-PSZ (Nilcra). Other zirconia ceramics investigated and compared to Mg-PSZ (Nilcra), were Mg-PSZ (feldmuehle), Y-TZP (feldmuehle) and Y-TZP (dynamic ceramic). It can be stated that there are significant differences in surface mechanical behavior between Mg-PSZ and Y-TZP. The residual stress profile and strength behavior of worn samples are different. During wear testing at low loads, adhesion and plastic deformation play a major role. At high loads, fracture becomes more important. Band formation is observed for some wear systems with Y-TZP. ESA

N93-31597# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
MICROSTRUCTURAL STUDIES OF CERAMIC THERMAL CARRIER COATINGS; HOW IT INFLUENCES COATINGS THERMOMECHANICAL RESISTANCE Ph.D. Thesis - Paris Univ., 1991 [ETUDE MICROSTRUCTURALE FINE DE REVETEMENTS CERAMIQUES DE TYPE BARRIERE THERMIQUE; INCIDENCE SUR LA RESISTANCE THERMOMECANIQUE DE CES REVETEMENTS]
Laurent Lelait Sep. 1992 141 p In FRENCH
(ONERA-NT-1992-9; ETN-93-93968) Avail: CASI HC A07/MF A02

The microstructure of thermal barrier coatings made of plasma sprayed yttria stabilized zirconia is investigated. Classical and analytical transmission electron microscopy and x-ray diffraction were applied. The aim of the study was to determine relationships between coating microstructure and toughness. The ceramic/metal interface was investigated. In the 6 to 8 weight Y2O3 range, the metastable tetragonal t prime phase was observed. After high temperature annealing in air, a very fine and stable precipitation of the equilibrium cubic phase appears. It is believed that these microstructural elements, absent outside the mentioned composition range, could act as crack deviation sites and could enhance of coatings intrinsic toughness. Microstructural investigations of the alumina scales grown during high temperature annealing reveal yttrium segregation at oxide grain boundaries as well as significant quantities of zirconium inside the alumina grains. The oxide growth seems to be dominated by a classical grain boundary oxygen diffusion mechanism. The presence of zirconium inside the alumina grains suggests that Al2O3 also partially forms by chemical reduction of ZrO2 by Al. ESA

N93-31636*# Houston Univ., TX. Dept. of Mechanical Engineering.
ANALYSIS OF EFFECTIVE THERMAL CONDUCTIVITY OF FIBROUS MATERIALS Final Report
Michael W. Futschik and Larry C. Witte 1 Jul. 1993 113 p
(Grant NAG9-532)
(NASA-CR-193242; NAS 1.26:193242) Avail: CASI HC A06/MF A02

The objective of this research is to gain a better understanding of the various mechanisms of heat transfer through fibrous materials and to gain insight into how fill-gas pressure influences the effective thermal conductivity. By way of first principles and some empiricism, two mathematical models are constructed to correlate experimental data. The data are obtained from a test series measuring the effective thermal conductivity of Nomex using a two-sided guarded hot-plate heater apparatus. Tests are conducted for certain mean temperatures and fill-gases over a range of pressures varying from vacuum to atmospheric conditions. The models are then evaluated to determine their effectiveness in representing the effective thermal conductivity of a fibrous material. The models presented herein predict the effective thermal conductivity of Nomex extremely well. Since the influence of gas conduction is determined to be the most influential component in predicting the effective thermal conductivity of a fibrous material, an improved representation of gas conduction is developed. Finally, some recommendations for extension to other random-oriented fiber

materials are made concerning the usefulness of each model depending on their advantages and disadvantages. Author (revised)

N93-31728# Japan Space Utilization Promotion Center, Tokyo.
PROMETHEUS IN SPACE: SURVEY REPORT OF RESEARCH COMMITTEE ON FUNCTIONAL NEW MATERIAL
Mar. 1993 165 p Original contains color illustrations
Avail: CASI HC A08/MF A02

The structure of this report consists of five chapters. In chapter 1, recent progress in material processing technologies is reviewed. It is also pointed out that there has been a technological evolution from the bulk crystalline age to the multilayered film age, with recent advances of the high vacuum technology accompanied by ultra-purification technologies of various elemental materials. Following, the future trends of macroelectronics, towards the 21st century, are forecasted. In the second section, some significances of space environment for material processing of macroelectronics functional devices, are enumerated and discussed. In the following chapters, material production technologies in space are classified into three phases of materials, and discussed accordingly. That is: bulk and solid materials in chapter 2, thin film functional materials in chapter 3, and gases and fine particle materials, including microcrystallines in chapter 4. In the final chapter, views and general problems for this newly cultivated technological field are discussed and summarized. Derived from text

N93-31801# Massachusetts Univ., Lowell. Dept. of Chemistry.
CERENKOV TYPE PHASE-MATCHED SECOND HARMONIC GENERATION IN POLYMERIC CHANNEL WAVEGUIDES Technical Report, 1 Jun. 1992 - 31 May 1993
Y. Chen, M. Kamath, A. Jain, J. Kumar, and S. Tripathy 31 May 1993 16 p
(Contract N00014-90-J-1148)
(AD-A265787; Rept-1148-93-02) Avail: CASI HC A03/MF A01

Fabrication of polymer channel waveguides by etching on glass is reported. Results on second harmonic generation (SHG) in the Cerenkov mode from stable poled polymeric channel waveguides are presented. The waveguide conversion efficiency for doubling of Nd:YAG laser beam was estimated to be 0.1 %/W with a total efficiency of 4.9 x 10 exp -7 %/W. DTIC

N93-31802# Massachusetts Univ., Lowell. Dept. of Chemistry.
FUNCTIONALIZED POLYMERIC MATERIALS FOR ELECTRONICS AND OPTICS Technical Report, 1 Jun. 1992 - 31 May 1993
S. Sengupta, J. Kumar, A. Jain, and S. Tripathy 31 May 1993 29 p
(Contract N00014-90-J-1148)
(AD-A265788; Rept-1148-93-13) Avail: CASI HC A03/MF A01

Polymeric materials are being developed to possess unique electronic and optical properties. A number of polymeric nonlinear optical polymers and electrically conducting polymers have been reported that also present significant processing and cost advantages. Design of new polymer materials for electronic and photonic applications rely on incorporation of molecular level functionalities into the polymer structure. These and other functionalities significantly impact the processing and fabrication characteristics of the thin film devices as well. Design, characterization and thin film fabrication aspects of candidate polymers are discussed. DTIC

N93-31828# Korean Atomic Energy Research Inst., Daeduk (Republic of Korea).
THE DEVELOPMENT OF SiC WHISKER FABRICATION TECHNOLOGY FOR NUCLEAR APPLICATIONS
Thae Khapp Kang, Il Hiun Kuk, Whung Whoe Kim, Hae Seung Paik, Kyung Soo Im, and Seok Jin Oh Feb. 1992 152 p
(DE93-605320; KAERI/RR-1096/91) Avail: CASI HC A08/MF A02 (US Sales Only)

A new silicothermic process for making SiC whisker was studied. By heating for 1 hour at 1,500 C SiO2-Si compact showed 71.56% weight loss. Such a reduction in weight attributed to the high reactivity of the compact. When SiO2-Si compact was covered by coarse ceramic granule layer, SiC whiskers were formed on surface of the ceramic granules. This new method is named a peach process. Among various C-containing source gases, hydrocarbon gases, such as methane, exhibited active whisker growth. Development of a new metallic composite reinforced with SiC whiskers was tried using zircaloy. DOE

N93-31991# North Carolina Univ., Chapel Hill. Dept. of Chemistry.
Si/SiO2 INTERFACE STUDIES BY IMMERSION ELLIPSOMETRY
Q. Liu and E. A. Irene 4 May 1993 8 p
(Contract N00014-89-J-1178)
(AD-A265151; TR-53) Avail: CASI HC A02/MF A01

The mechanisms associated with Si/SiO2 interface annealing and thermal oxidation conditions were studied by spectroscopic immersion ellipsometry. Essentially, this surface sensitive ellipsometry technique uses liquids that refractive-index match with the films, thereby optically removing the films. With the use of an optical model, it is shown that at annealing temperatures viscous relaxation dominates, while at low annealing temperatures the suboxide reduction is apparent. It is also shown that with the thickening SiO2 overlayer, the thickness of the suboxide layer at the interface increases, and the average radius of the crystalline silicon protrusions decreases for the three different orientations studied. These results are consistent with the commonly accepted Si oxidation model. DTIC

N93-31993# California Univ., Los Angeles. Dept. of Materials Science and Engineering.
PRECIPITATION HARDENING OF INFRARED TRANSMITTING ZnS CERAMICS Final Report
B. Dunn and A. J. Ardell 1 Jun. 1993 4 p
(Contract N00014-91-J-1664)
(AD-A265184) Avail: CASI HC A01/MF A01

Precipitation strengthening is a potentially attractive technique for hardening and toughening infrared transmitting materials. The controlled precipitation of a finely dispersed second phase offers the opportunity to improve mechanical properties without degrading optical properties. It is well established that the presence of an appropriate dispersion of second phase particles can improve the mechanical behavior of ceramics, and, by maintaining a particle size less than 100 nm, scattering losses in the infrared will be circumvented. DTIC

N93-32010# Westinghouse Science and Technology Center, Pittsburgh, PA.
IMPROVED GALLIUM NITRIDE AND ALUMINUM NITRIDE ELECTRONIC MATERIALS Annual Report, 20 Feb. 1992 - 19 Feb. 1993
W. D. Partlow, W. J. Choyke, R. P. Devaty, John T. Yates, Jr., and Karl-Heinz Bornschauer 25 Mar. 1993 43 p
(Contract F49620-91-C-0032)
(AD-A264570; Rept-93-9SB2-Algan-R1; AFOSR-93-0347TR) Avail: CASI HC A03/MF A01

This report describes the progress in the second year of a three year program to improve the quality of gallium and aluminum nitride electronic materials. In this period we completed surface chemistry equipment modifications and characterization, and began experiments to control and understand the surface reactions associated with the growth of gallium nitride. By subjecting a physisorbed monolayer of trimethyl gallium (TMG) to a cool beam of atomic hydrogen atoms, we successfully converted it to metallic Ga, which is much more reactive with nitriding species and will result in a more stoichiometric and higher purity gallium nitride. In the materials characterization effort of the program, infrared reflectance spectra and cathodoluminescence spectra were measured for epitaxial AlN films. The reflectance spectra were compared to a Lorentz oscillator model which make it possible to separate out the contribution of the AlN even when the bands of the film and substrate overlapped. DTIC

N93-32161# Oak Ridge National Lab., TN.
CERAMIC TECHNOLOGY PROJECT DATABASE Report, period ending Sep. 1990
B. L. P. Keyes Jun. 1992 119 p
(Contract DE-AC05-84OR-21400)
(DE93-012429; ORNL/M-1861) Avail: CASI HC A06/MF A02

Data generated within the Ceramic Technology Project (CTP) represent a valuable resource for both research and industry. The CTP database was created to provide easy access to this information in electronic and hardcopy forms by using a computerized database and by issuing periodic hardcopy reports on the database contents. This report is the sixth in a series of semiannual database summaries and covers recent additions to the database, including joined brazed specimen test data. It covers 1 SiC, 34 SiN, 10 whisker-reinforced SiN, 2 zirconia-toughened aluminas, 8 zirconias, and 34 joints. DOE

N93-32186# Los Alamos National Lab., NM.
CERAMICS MODELS IN THE MESA CODES
D. A. Mandell and R. Henninger 1992 24 p Presented at the Hypervelocity Impact Symposium, Austin, TX, 17-20 Nov. 1992
(Contract W-7405-eng-36)
(DE93-000683; LA-UR-92-3003; CONF-921162-9) Avail: CASI HC A03/MF A01 (US Sales Only)

We have implemented two ceramics models into the MESA Eulerian finite difference hydrocodes and evaluated them by comparing code predictions of the free surface velocity as a function of time to data for one-dimensional flyer plate impacts and to free surface velocity data for the penetration of subscale tungsten rods into ceramic plates. Results were obtained for silicon carbide, boron carbide, alumina, titanium diboride, and for a base calculation using a steel plate. DOE

N93-32187# Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil).
PHYSICAL CHARACTERIZATION AND STUDY OF THE ELECTRICAL MAGNETIC AND THERMAL PROPERTIES OF THE CERAMIC HIGH Tc SUPERCONDUCTOR Y1Ba2Cu3O(7-x)
Marcos Tadeu DAzeredoOrlando 1991 120 p
(DE92-640219; INIS-BR-2925) Avail: CASI HC A06/MF A02 (US Sales Only)

It was built so that four systems for physical characterization of high Tc superconductors, with data acquisition by computer, and recent results on AC susceptibility, AC resistivity, specific heat, and thermal diffusivity of the YBa2Cu3O(7-x)(x approximately = 0.15) compound, in a ceramic form, could be reproduced. Our study pointed that those ceramics exhibit a preferential orientation of the grains, being the c axis of the compound parallel to the compression direction. The study of this material in the four different technics, for samples with same density and oxygen stoichiometry, has pointed also that its magnetic behavior is strongly influenced by the intergrain region. This influence can be described by the Clem model for the intergrain region and by the Malozemoff proposition for the fluxoids collective behavior. DOE

N93-32209 Department of the Navy, Washington, DC.
EPOXY SELF-PRIMING TOPCOATS Patent
Charles R. Hegedus, inventor (to Navy), Donald J. Hirst, inventor (to Navy), and Anthony T. Eng, inventor (to Navy) 13 Apr. 1993 5 p Filed 31 Mar. 1992
(AD-D015737; US-Patent-5,202,367; US-Patent-Appl-SN-860837; US-Patent-Class-524-204) Avail: US Patent and Trademark Office

A corrosion-resistant coating which can be applied directly to a surface as a self-priming topcoat comprising an epoxy resin binder and a combination of pigments consisting essentially of an alkaline earth metal phosphosilicate, zinc salts of benzoic acids, and an alkaline earth metal phosphate such as zinc-barium phosphate is described. In addition, the coating contains up to about 35 parts by weight of a titanium dioxide pigment, up to about 3.0 parts by weight of an oil soluble surface active agent, and up to about 50 parts by weight of at least one organic solvent. DTIC

N93-32292# Air-Conditioning and Refrigeration Technology Inst., Inc., Arlington, VA.
MATERIALS COMPATIBILITY AND LUBRICANTS RESEARCH ON CFC-REFRIGERANT SUBSTITUTES
D. A. Godwin, G. C. Hourahan, and S. R. Szymurski Apr. 1993 41 p
(Contract DE-FG02-91CE-23810)
(DE93-014770; DOE/CE-23810/11) Avail: CASI HC A03/MF A01

The Materials Compatibility and Lubricants Research (MCLR) program supports critical research to accelerate the introduction of CFC-refrigerant substitutes. The MCLR program addresses refrigerant and lubricant properties and materials compatibility. The primary elements of the work include data collection and dissemination, materials compatibility testing, and methods development. The work is guided by an Advisory Committee consisting of technical experts from the refrigeration and air-conditioning industry and government agencies. Under the current MCLR program, the Air-Conditioning and Refrigeration Technology Institute, Inc., (ARTI) is contracting and managing multiple research projects and a data collection and dissemination effort. Detailed results from these projects are reported in technical reports prepared by each researcher. DOE

N93-32293# Spauschus Associates, Inc., Atlanta, GA.
SOLUBILITY, VISCOSITY AND DENSITY OF REFRIGERANT/LUBRICANT MIXTURES
D. R. Henderson Apr. 1993 31 p Prepared in cooperation with Air-Conditioning and Refrigeration Technology Inst., Inc., Arlington, VA
(Contract DE-FG02-91CE-23810)
(DE93-014771; DOE/CE-23810/11A) Avail: CASI HC A03/MF A01

This report presents results for low refrigerant concentration (70, 80, 90, and 100 weight percent lubricant) mixtures of the following fluids: CFC-12/ISO 32 naphthenic mineral oil, HCFC-22/ISO 32 naphthenic mineral oil, CFC-12/ISO 100 naphthenic mineral oil, HFC-134a/ISO 22 pentaerythritol ester mixed acid, HFC-134a/ISO 32 pentaerythritol ester mixed acid #1, HFC-134a/ISO 68 pentaerythritol ester mixed acid, HFC-134a/ISO 100 pentaerythritol ester mixed acid, HFC-134a/ISO 32 pentaerythritol ester mixed acid #2, HCFC-123/ISO 32 naphthenic mineral oil, HCFC-123/ISO 100 naphthenic mineral oil, HCFC-123/150 SUS alkylbenzene, and HCFC-123/300 SUS alkylbenzene. These data have been reduced to engineering form and are presented in the form of a Daniel Chart. Equations are given along with statistical measures of goodness of fit. DOE

N93-32307# United Technologies Corp., East Hartford, CT. Research Center.
INVESTIGATION OF PACVD PROTECTIVE COATING PROCESSES USING ADVANCED DIAGNOSTICS TECHNIQUES
W. C. Roman May 1993 14 p
(Contract DE-FG02-86ER-13560)
(DE93-013978; DOE/ER-13560/7) Avail: CASI HC A03/MF A01

The objective of this investigation is to understand the mechanisms governing nonequilibrium plasma atomistic or molecular deposition of hard face coatings. Laser diagnostic methods include Coherent Anti-Stokes Raman Spectroscopy (CARS) and laser-induced fluorescence. Diamonds and TiB2 were used as the hard face coating materials. Diborane was used as precursor to TiB2. DOE

N93-32314# University of Southern Mississippi, Hattiesburg. Dept. of Polymer Science.
SYNTHESIS AND CHARACTERIZATION OF COPOLYMERS OF NYLON 11 AND NYLON 12 Technical Report No. 53, 1 Jun. 1992 - 31 May 1993
C. G. Johnson and Lon J. Mathias 7 Jun. 1993 35 p
(Contract N00014-89-J-1225)
(AD-A265841) Avail: CASI HC A03/MF A01

A series of copolymers was prepared from 11-aminoundecanoic and 12-aminododecanoic acids by melt-condensation at 210 C in sealed tubes under vacuum. Mole percentages of nylon 12 monomer were 0, 15, 35, 50, 65, 85, and 100 percent in the feed. The amide group was labelled using nitrogen 15-labelled amino acids available through the Gabriel synthesis (only the 1:1 copolymer was enriched with nitrogen-15). Solid-state carbon 13 (at 100.6 MHz) and nitrogen 15 (at 20.3 MHz) NMR spectroscopy, differential scanning calorimetry, wide-angle x-ray diffraction, and infrared spectroscopy were used to characterize the copolymers. Solid-state N-15 NMR spectra showed a smooth shift of the main peak position from 84 ppm for alpha-nylon 11 to 89 ppm for gamma-nylon 12 for the as-prepared copolymers. Similar behavior was seen from amide 5 and 6 modes which are sensitive the alpha- and gamma-crystal forms. C-13 NMR T1 measurements showed that the most mobile sample was the 63:35 nylon 11-co-12 polymer. DTIC

N93-32352*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
TRIBOLOGICAL CHARACTERISTICS OF PERFLUOROPOLYETHER LIQUID LUBRICANTS UNDER SLIDING CONDITIONS IN HIGH VACUUM
Masabumi Masuko (Tokyo Inst. of Tech., Japan.), William R. Jones, Jr., and Larry S. Helmick Jul. 1993 7 p Prepared for presentation at Eurotrib 1993 Conference, Budapest, Hungary, 30 Aug. - 2 Sep. 1993; sponsored by the Hungarian Society of Mechanical Engineers
(RTOP 505-63-5A)
(NASA-TM-106257; E-7980; NAS 1.15:106257) Avail: CASI HC A02/MF A01

Tribological characteristics of three PFPE's (Fomblin Z, Demnum, and Krytox) were studied under high vacuum using a four-ball apparatus with 440C steel specimens. Fomblin Z and Demnum exhibited initial scuffing-like

high friction whereas Krytox did not. Steady state friction with Fomblin Z was the lowest among the three oils. Frictional values for Demnum and Krytox were almost the same. The lowest wear rate in air was provided by Krytox regardless of load, and low wear rates in vacuum at high load were achieved with Krytox and Demnum. Results are explained by reactivity and pressure-viscosity characteristics of the oils. Author (revised)

N93-32367*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
DETERMINATION OF THE OXIDATIVE STABILITY OF PERFLUOROPOLYALKYL ETHERS AND CORRELATION WITH CHEMICAL STRUCTURE
Larry S. Helmick (Cedarville Coll., OH.) and William R. Jones, Jr. May 1992 14 p Presented at the Annual Meeting of the Society of Tribologists and Lubrication Engineers, Philadelphia, PA, 4-7 May 1992; sponsored by the Society of Tribologists and Lubrication Engineers
(RTOP 505-53-1A)
(NASA-TM-106223; E-7940; NAS 1.15:106223) Avail: CASI HC A03/MF A01

The oxidative stabilities of several perfluoropolyalkyl ethers (PFPAE) with related chemical structures were determined by thermal gravimetric analysis and correlated with their chemical structures. These results show that oxidative stability increases as the number of difluoroformal groups decreases and as trifluoromethyl substituents are added. They are also consistent with a recently proposed intramolecular disproportionation reaction mechanism involving coordination of successive ether oxygens to a Lewis acid. Since polytetrafluoroethylene contains no oxygen, it provides an indication of the upper limit to oxidative stability of PFPAE fluids. These results also show that oxidative decomposition of PFPAE fluids requires the presence of an active metal as well as air. Consequently, it may be possible to minimize decomposition and thus improve oxidative stability by passivating reactive metal surfaces. Author (revised)

N93-32382*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
STRESS-RUPTURE BEHAVIOR OF SMALL DIAMETER POLYCRYSTALLINE ALUMINA FIBERS
Hee Mann Yun (Cleveland State Univ., OH.), Jon C. Goldsby, and James A. DiCarlo Apr. 1993 14 p Presented at the 95th Annual Meeting and Exposition of the American Ceramic Society, Cincinnati, OH, 18-23 Apr. 1993
(RTOP 510-01-50)
(NASA-TM-106256; E-7979; NAS 1.15:106256) Avail: CASI HC A03/MF A01

Continuous length polycrystalline alumina fibers are candidates as reinforcement in high temperature composite materials. Interest therefore exists in characterizing the thermomechanical behavior of these materials, obtaining possible insights into underlying mechanisms, and understanding fiber performance under long term use. Results are reported on the time-temperature dependent strength behavior of Nextel 610 and Fiber FP alumina fibers with grain sizes of 100 and 300 nm, respectively. Below 1000 C and 100 hours, Nextel 610 with the smaller grain size had a greater fast fracture and rupture strength than Fiber FP. The time exponents for stress-rupture of these fibers were found to decrease from approximately 13 at 900 C to below 3 near 1050 C, suggesting a transition from slow crack growth to creep rupture as the controlling fracture mechanism. For both fiber types, an effective activation energy of 690 kJ/mol was measured for rupture. This allowed stress-rupture predictions to be made for extended times at use temperatures below 1000 C. Author (revised)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N93-31186# Los Alamos National Lab., NM.
NTO POLYMORPHS
Kien-Yin Lee and R. Gilardi 1992 6 p Presented at the 16th Material Research Society International Symposium on the Scientific Basis for Nuclear Waste Management Fall Meeting, Boston, MA, 30 Nov. - 5 Dec. 1992
(Contract W-7405-eng-36)
(DE93-005451; LA-UR-92-4025; CONF-921101-61) Avail: CASI HC A02/MF A01 (US Sales Only)

NTO (5-Nitro-2,4-dihydro 3H-1,2,4-triazol-3-one) was evaluated as an insensitive component to replace RDX in the bomb fill, and as a major ingredient for the auto air bag system. The crystal structure of the beta form of NTO was determined by single-crystal x-ray methods. The unit cell is monoclinic, space group P2(sub 1)/c, with a = 9.326, b = 5.515, c = 9.107 Angstrom, beta = 100.77 degrees. There are four molecules in the cell, density 1.878 g/cu cm. Infinite extension of H-bonding in two-dimensional sheets occurs in the monoclinic form. Bond lengths and angles all have normal values. Efforts were made to determine the crystal structure of alpha-NTO. However, a structure refined only to R = 17% was obtained, probably due to some kind of twinning about the crystal needle axis. The unit cell is triclinic, space group P1, with a = 5.12, b = 10.30, c = 17.9 (Angstrom), alpha = 106.7 degrees, beta = 97.7 degrees, gamma = 90.2 degrees. There are eight molecules in the cell, density 1.92 g/cu cm. Ribbons of NTO molecules formed by a relatively strong network of hydrogen bonds are observed. It was found that alpha-NTO is the stable, dominating form. A variety of techniques were chosen to identify the two polymorphs. DOE

N93-31308*# National Aeronautics and Space Administration, Washington, DC.
NASA AEROSPACE PYROTECHNICALLY ACTUATED SYSTEMS: PROGRAM PLAN
Norman R. Schulze Feb. 1992 40 p
(NASA-TM-109226; NAS 1.15:109226) Avail: CASI HC A03/MF A01

The NASA Aerospace Pyrotechnically Actuated Systems (PAS) Program, a focused technology program, is being initiated to enhance the reliability, safety, and performance of pyrotechnically actuated systems. In broad terms, this Program Plan presents the approach that helps to resolve concerns raised by the NASA/DOD/DOE Aerospace Pyrotechnic Steering Committee. This Plan reflects key efforts needed in PAS technology. The resources committed to implement the Program will be identified in the Program Implementation Plan (PIP). A top level schedule is included along with major Program milestones and products. Responsibilities are defined in the PIP. The Plan identifies the goals and detailed objectives which define how those goals are to be accomplished. The Program will improve NASA's capabilities to design, develop, manufacture, and test pyrotechnically actuated systems for NASA's programs. Program benefits include the following: advanced pyrotechnic systems technology developed for NASA programs; hands-on pyrotechnic systems expertise; quick response capability to investigate and resolve pyrotechnic problems; enhanced communications and intercenter support among the technical staff; and government-industry PAS technical interchange. The PAS Program produces useful products that are of a broad-based technology nature rather than activities intended to meet specific technology objectives for individual programs.
Derived from text

N93-31326# Texas Univ., Austin. Center for Transportation Research.
COST-EFFECTIVENESS ANALYSIS OF txDOT LPG FLEET CONVERSION, VOLUME 1 Interim Research Report
M. A. Euritt, D. B. Taylor, and H. Mahmassani Oct. 1992 176 p See also PB93-186500 and PB93-165603 Sponsored by Texas Dept.of Transportation, Austin
(PB93-186492; CTR-3-4-90/2-983-4/1; TX-93+983-4-Vol-1) Avail: CASI HC A09/MF A02

Increased emphasis on energy efficiency and air quality has resulted in a number of state and federal initiatives examining the use of alternative fuels for motor vehicles. Texas' program for alternate fuels includes liquefied petroleum gas (LPG). Based on an analysis of 30-year life-cycle costs, development of a propane vehicle program for the Texas Department of Transportation (TxDOT) would cost about $24.3 million (in 1991 dollars). These costs include savings from lower-priced LPG and differentials between propane and gasoline/diesel in infrastructure costs for a fueling station, vehicle costs, and operating costs. The 30-year life-cycle costs translate into an average annual vehicle cost increase of $308, or about 2.5 cents more per vehicle mile of travel. Sensitivity analyses are performed on the discount rate, price of propane, maintenance savings, vehicle utilization,

diesel vehicles, extended vehicle life, original equipment manufacturer (OEM) vehicles, and operating and infrastructure costs. The best results are obtained when not converting diesel vehicles, converting only large fleets, and extending the period the vehicle is kept in service. Combining these factors yields results that are most cost-effective for TxDOT. This is volume one of two volumes. NTIS

N93-31327# Texas Univ., Austin. Center for Transportation Research.
COST-EFFECTIVENESS ANALYSIS OF txDOT LPG FLEET CONVERSION, VOLUME 2 Interim Research Report
M. A. Euritt, D. B. Taylor, and H. Mahmassani Nov. 1992 324 p See also PB93-186492 and PB93-159432 Sponsored by Texas Dept.of Transportation, Austin
(PB93-186500; CTR-3-4-90/2-983-4/2; TX-93+983-4-Vol-2) Avail: CASI HC A14/MF A03

Increased emphasis on energy efficiency and air quality has resulted in a number of state and federal initiatives examining the use of alternative fuels for motor vehicles. Texas' program for alternate fuels includes liquefied petroleum gas (LPG), commonly called propane. Based on an analysis of 30-year life-cycle costs, development of a propane vehicle program for the Texas Department of Transportation (TxDOT) would cost about $24.3 million (in 1991 dollars). These costs include savings from lower-priced propane and differentials between propane and gasoline/diesel in infrastructure costs, vehicle costs, and operating costs. The 30-year life-cycle costs translate into an average annual vehicle cost increase of $308, or about 2.5 cents more per vehicle mile of travel. Based on the cost-effectiveness analysis and assumptions, there are currently no TxDOT locations that can be converted to propane without additional financial outlays. This is volume two of two volumes. NTIS

N93-31434# Acurex Corp., Mountain View, CA.
LNG AS A FUEL FOR RAILROADS: ASSESSMENT OF TECHNOLOGY STATUS AND ECONOMICS Topical Report, Jun. - Sep. 1992
C. J. Pera and C. B. Moyer 6 Jan. 1993 113 p Sponsored by Gas Research Inst., Chicago, IL
(Contract GRI-5091-292-2153)
(PB93-188787; GRI-93/0132) Avail: CASI HC A06/MF A02

The objective of the research was to investigate the feasibility of liquefied natural gas (LNG) as a fuel for railroads. The investigation included assessment of the status of relevant technologies (i.e., LNG-fueled locomotive engines, tender cars, refueling equipment), a review of current demonstration projects, and an analytical evaluation of LNG railroad economics. NTIS

N93-31639# Materials Research Labs., Maribyrnong (Australia).
COMMISSIONING AND OPERATING INSTRUCTIONS OF ONE PINT (US) MIXER
P. J. Barry and J. Levers Feb. 1993 43 p
(MRL-TN-634) Avail: CASI HC A03/MF A01

A one pint (U.S.) vertical bladed planetary action mixer was installed in Production Development Area No. 2 of the Materials Research Laboratory (MRL) Explosives Ordnance Division, Salisbury. This report presents the rationale for purchasing the mixer, a description of the equipment installed, and the operating instructions. Author (revised)

N93-31800# Materials Research Society, Pittsburg, PA.
STRUCTURE AND PROPERTIES OF ENERGETIC MATERIALS
Donald H. Liebenberg, Ronald W. Armstrong, and John J. Gilman 2 Dec. 1992 402 p
(Contract N00014-93-1-0147)
(AD-A265775) Avail: CASI HC A18/MF A04

This was the first Symposium on Energetic Materials held at a Materials Research Society Meeting. Energetic materials are substances that undergo exothermic chemical reaction in response to some stimulus and react in time scales leading to combustion, explosion, and/or detonation (millisec to femtosec). Energetic materials represent a multibillion dollar industry for both commercial and military uses. These are among the earliest of man-made classes of materials. Their historical role in the development of nations has been enormous. Land clearing, railroad and highway construction, and mining continue as important though not exclusive uses. The space program is enabled by energetic materials. DTIC

N93-32030# Army Research Lab., Aberdeen Proving Ground, MD.
A SUMMARY OF THE JANNAF WORKSHOP ON METHODS FOR EXCHANGE OF GUN PROPELLANT BURNING RATE INFORMATION Final Report
Frederick W. Robbins and John A. Vanderhoff May 1993 31 p Workshop held in Aberdeen Proving Ground, MD, 21-22 Jul. 1992
(AD-A264113; ARL-TR-127) Avail: CASI HC A03/MF A01

A workshop sponsored by the JANNAF Propellant Development and Characterization Subcommittee was held at the U.S. Army Ballistic Research Laboratory, Aberdeen Proving Ground, MD on 21-22 Jul. 1992. The purpose of the workshop was to define methods for exchanging propellant burning rate (BR) information. A recently developed BR reduction code (BRLCB) was subject to testing, and a major item of progress for the workshop was to accept BRLCB as an interim preferred closed bomb code for data exchange purposes. Additionally, workshop attendees agreed that the input thermochemistry for BRLCB should be calculated for a 0.2 loading density. DTIC

N93-32077# Weizmann Inst. of Science, Rehovoth (Israel).
ADVANCES IN ANALYSIS AND DETECTION OF EXPLOSIVES. PROCEEDINGS OF THE 4TH INTERNATIONAL SYMPOSIUM ON ANALYSIS AND DETECTION OF EXPLOSIVES
Jehuda Yinon 10 Sep. 1992 552 p Symposium held in Jerusalem, Israel, 7-10 Sep. 1992
(Contract DAJA45-92-M-0117)
(AD-A265002; R/D-6855-CH-02) Avail: CASI HC A24/MF A04

Among the topics presented at this symposium were: Birmingham Six Pub Bombing Case (Keynote Lecture); A Scheme for the Analysis of Explosives and Explosive Residues in Japan; Antibody-Based Field Test Kits for Explosives; Smokeless Powder Characterization - An Investigative Tool in Pipe Bombings; Applications of Ion Chromatography for Determination and Identification of Chlorate, Nitrate and Nitrite in Explosives and Explosive Residues; Sample Preparation by Supercritical Fluid Extraction in Explosives; The Semtex-H Story; The Identification of Organic Peroxides; Slurry and Emulsion Explosives: New Tools for Terrorists, New Challenges for Detection and Identification; The Work of the Explosives and Gunshot Residues Unit of the Forensic Science Service (UK). DTIC

N93-32085 Logistics Management Inst., Bethesda, MD.
MAKING CLEAN GASOLINE: THE EFFECT ON JET FUELS
Robert W. Salthouse Sep. 1992 73 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract MDA903-90-C-0006)
(AD-A264302; LMI-PL015-R1) Avail: CASI HC A04

Persistently high concentrations of carbon monoxide and low-altitude ozone in the air of the Nation's major urban centers led Congress in the 1990 Clean Air Act Amendments to mandate changes to the composition of gasoline and diesel fuel. Those gasoline composition changes will require major modifications to the manufacturing processes that refiners use to produce gasoline for sale in much of the United States. Since petroleum refining is a complex process involving a variety of chemical interactions between final products, many observers--including DoD fuel managers--fear possible declines in the quality and availability of jet fuel. Currently, the Air Force plans to convert from naphtha-based JP-4 jet fuel to distillate-based JP-8 jet fuel. Despite the extent of the required refinery process modifications, however, we conclude that neither the quality nor the availability of jet fuel purchased by the military is likely to change significantly. Among the provisions of the 1990 Clean Air Act Amendments is a limit on aromatic compounds in gasoline, which led to fears that refiners would divert excess aromatic compounds into jet fuel. However, refiners are unlikely to do that for two reasons. First, existing jet fuel specification--'smoke point' and a maximum aromatic ceiling--already limit the refiners' ability to increase the volume of aromatics in jet fuel. Second, the manufacture of aromatics to improve gasoline performance is expensive. DTIC

N93-32330*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
NON-CONTACT HEAT FLUX MEASUREMENT USING A TRANSPARENT SENSOR
Daniel Ng and Charles M. Spuckler Jul. 1993 13 p
(RTOP 303-50-00)

(NASA-TM-106252; E-7974; NAS 1.15:106252) Avail: CASI HC A03/MF A01

A working non-contact heat flux sensor was demonstrated using a transparent material (sapphire) and a multiwavelength pyrometer. The pyrometer is used to measure the temperatures of the two surfaces of the sensor from the spectrum of radiation originating from them. The heat conducted through the material is determined from the temperature difference of the two surfaces and the thermal conductivity of the material. The measured heat flux is equal to the incident heat flux within experimental error indicating that no calibration would be necessary. A steady state heat flux of 100 kW/sq m was easily achieved. Author (revised)

29 MATERIALS PROCESSING

Includes space-based development of products and processes for commercial applications.

For biological materials see *55 Space Biology.*

N93-32387# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.

TOWARDS DISTRIBUTED CONTROL SYSTEMS FOR EXPERIMENTS UNDER MICRO GRAVITY

L. J. Aartman and R. H. Huijser (Fokker Space and Systems, Amsterdam, Netherlands.) 29 Jan. 1992 11 p Presented at the IEEE Instrumentation/Measurement Technology Conference, New York, NY, 12-14 May 1992

(NLR-TP-92027-U; ETN-93-94080; AD-B169117L) Avail: CASI HC A03/MF A01

The basic concepts and examples of the experiment control systems developed for microgravity research are illustrated. These systems are based on a control concept that relies on software for its functions: data acquisition, actuator control, data storage, experiment scenario execution, and communication with a personal computer system for test and checkout. System configuration takes place by means of tables: a description of the most recent parameter base for data handling and the experiment action control table for the execution of an experiment scenario. The first generation system was used in 1989 and 1990 on sounding rockets. A second generation system is being developed with provisions for distributed control. Interfacing through data communication results in improved modularity, improved subsystem testability, and simplified interfacing. Single chip microcontrollers and the same software based control concept are the core of smart experiment subsystems. They will fulfill distributed control functions in a complex experiment facility: a hierarchy through a facility controller unit allows operator interaction from a connected computer into the facility and its subsystems. ESA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

N93-31109# National Inst. of Standards and Technology, Gaithersburg, MD. Metric Program.

METRICATION: AN ECONOMIC WAKE-UP CALL FOR US INDUSTRY

G. P. Carver Mar. 1993 16 p See also PB92-222249

(PB93-188969; NISTIR-5154) Avail: CASI HC A03/MF A01

As the international standard of measurement, the metric system is one key to success in the global marketplace. International standards have become an important factor in international economic competition. Non-metric products are becoming increasingly unacceptable in world markets that favor metric products. Procurement is the primary federal tool for encouraging and helping U.S. industry to convert voluntarily to the metric system. Besides the perceived unwillingness of the customer, certain regulatory language, and certain legal definitions in some states, there are no major impediments to conversion of the remaining non-metric industries to metric usage. Instead, there are good reasons for changing, including an opportunity to rethink many industry standards and to take advantage of size standardization. Also, when the remaining industries adopt the metric system, they will come into conformance with federal agencies engaged in similar activities. NTIS

N93-31196# National Inst. of Standards and Technology, Gaithersburg, MD. Precision Engineering Div.

MEASUREMENT UNCERTAINTY CONSIDERATIONS FOR COORDINATE MEASURING MACHINES

S. D. Phillips, B. Borchardt, and G. Caskey Apr. 1993 35 p See also PB92-164680 and PB93-159465

(PB93-189819; NISTIR-5170) Avail: CASI HC A03/MF A01

The report examines some uncertainty considerations for dimensional measurements performed on a three axis coordinate measuring machine (CMM). The interaction between measurement uncertainty and part tolerance is briefly presented, and the factors affecting CMM measurements are discussed and their uncertainty described using the approach recommended by the International Committee for Weights and Measures (CIPM). Several of the current technical difficulties which make a rigorous uncertainty evaluation problematic are considered, and some simple examples are presented. NTIS

N93-31465 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.

MODELING INDUSTRIAL DISTRIBUTED CONTROL SYSTEMS WITH PETRI NETS

M. Bozzola (Master School CEFRIEL, Milan, Italy.), P. Lluka (Master School CEFRIEL, Milan, Italy.), C. Rinaudo (Master School CEFRIEL, Milan, Italy.), and R. Scattolini 1992 26 p Sponsored in part by CNR and Ministry of University and Research and Scientific Technology

(Rept-92-079; ETN-93-94002) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

A formalism for the modeling of a sufficiently comprehensive class of industrial distributed control systems is presented. The proposed methodology is based on condition/event Petri nets which allow the formal verification of important properties of the control system structure, such as absence of blocking states or non-cyclic conditions. The feasibility of the approach is shown by modeling with Petri nets an industrial distributed control system. Some extensions of the basic condition event nets are also considered to describe the temporal behavior of the system. ESA

N93-31539# Technische Univ., Eindhoven (Netherlands).

NEAR MISS REPORTING IN THE CHEMICAL PROCESS INDUSTRY Ph.D. Thesis

Tjerk Woutherus vanderSchaaf 1992 114 p

(ISBN-9-03-860181-6; ETN-93-94045) Copyright Avail: CASI HC A06/MF A02

A study aimed at showing that near miss reporting and analysis is a substantial step forward in solving problems in industrial safety management is presented. The following design aspects are discussed and illustrated: the modeling of 'human error' in relation to technical and organization failure; the use of such a classification model as the basis of a framework for a complete 'near miss management system'. A first step towards validating through a series of discussions with safety managers in the chemical process industry is described. ESA

N93-31545# Technical Research Centre of Finland, Espoo. Safety Engineering Lab.

APPLYING MORT MAINTENANCE SAFETY ANALYSIS IN FINNISH INDUSTRY [KUNNOSSAPIDON TURVALLISUUSANALYYSI MORT. KAESIKIRJA]

Kaarin Ruuhilehto and Kimmo Virolainen Feb. 1992 69 p In FINNISH Sponsored by Finnish Work Environment Fund Prepared in cooperation with Rauma-Repola Oy, Tampere, Finland

(VTT-TIED-1332; ISBN-9-51-384145-6; ETN-93-94012) Copyright Avail: CASI HC A04/MF A01

A safety analysis method based on MORT (Management Oversight and Risk Tree) method, especially on the version developed for safety considerations in the evaluation of maintenance programs, is presented. The MORT maintenance safety analysis is intended especially for the use maintenance safety management. The analysis helps managers evaluate the goals of their safety work and measures taken to reach them. The analysis is done by a team or teams. The team ought to have expert knowledge of the organization both vertically and horizontally in order to be able to identify factors that may contribute to accidents or other interruptions in the maintenance work. Identification is made by using the MORT maintenance key question set as a check list. The questions check

the way safety matters are connnected with the maintenance planning and managing, as well as the safety management itself. In the second stage, means to eliminate the factors causing problems are developed. New practices are established to improve safety of maintenance planning and managing in the enterprise. ESA

N93-31867 Kaman Sciences Corp., Colorado Springs, CO.
STATISTICS OF MASS PRODUCTION Technical Report, 1 Jan. - 15 Mar. 1992
R. L. Williams and Wilson Y. Gateley 1 May 1993 66 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DNA001-89-C-0080)
(AD-A264365; K92-IOU(R); DNA-TR-92-79) Avail: CASI HC A04

This paper summarizes the statistical quality control methods and procedures that can be employed in mass producing electronic parts (integrated circuits, buffers, capacitors, connectors) to reduce variability and ensure performance to specified radiation, current, voltage, temperature, shock, and vibration levels. Producing such quality parts reduces uncertainties in performance and will aid materially in validating the survivability of components, subsystems, and systems to specified threats. DTIC

N93-32163# Spauschus Associates, Inc., Atlanta, GA.
CHEMICAL AND THERMAL STABILITY OF REFRIGERANT-LUBRICANT MIXTURES WITH METALS
D. F. Huttenlocher Oct. 1992 118 p
(Contract DE-FG02-91CE-23810)
(DE93-013082; DOE/CE-23810/5) Avail: CASI HC A06/MF A02

This report presents the results of a sealed tube stability study on twenty-one refrigerant-lubricant mixtures selected from the following groupings: HFCs R-32, R-125, R-134, R-134a, R-143a, and R-152a with one or more lubricants selected from among three pentaerythritol esters and three polyalkylene glycols. All lubricants were carefully predried to 25 ppm or less moisture content. HCFCs R-22, R-123, R-124, and R-142b, as well as CFC R-11, with one or more lubricants were selected from among two mineral oils and one alkylbenzene fluid. Each test mixture was aged at three temperature levels. DOE

N93-32227*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
A DECOUPLED CONTROL APPROACH FOR MAGNETIC SUSPENSION SYSTEMS USING ELECTROMAGNETS MOUNTED IN A PLANAR ARRAY
Nelson J. Groom Aug. 1993 19 p
(RTOP 506-59-61-05)
(NASA-TM-109011; NAS 1.15:109011) Avail: CASI HC A03/MF A01

A decoupled control approach for a Large Gap Magnetic Suspension System (LGMSS) is presented. The control approach is developed for an LGMSS which provides five degree-of-freedom control of a cylindrical suspended element that contains a core composed of permanent magnet material. The suspended element is levitated above five electromagnets mounted in a planar array. Numerical results are obtained by using the parameters of the Large Angle Magnetic Suspension Test Fixture (LAMSTF) which is a small scale laboratory model LGMSS. Author

N93-32408# PRC Environmental Management, Inc., McLean, VA.
APPLICATIONS ANALYSIS REPORT: SILICATE TECHNOLOGY CORPORATION'S SOLIDIFICATION/STABILIZATION TECHNOLOGY FOR ORGANIC AND INORGANIC CONTAMINANTS IN SOILS
E. Bates Dec. 1992 150 p
(Contract EPA-68-03-3484)
(PB93-172948; EPA/540/AR-92/010) Avail: CASI HC A07/MF A02

The STC demonstration was conducted under EPA's Superfund Innovative Technology Evaluation (SITE) Program in November, 1990, at the Selma Pressure Treating (SPT) wood preserving site in Selma, California. The SPT site was contaminated with both organics, predominantly pentachlorophenol (PCP), inorganics, mainly arsenic, chromium, and copper. Extensive sampling and analyses were performed on the waste both before and after treatment to compare physical, chemical, and leaching characteristics of raw and treated wastes. STC's contaminated soil treatment process was evaluated based on contaminant mobility measured by numerous leaching tests, structural integrity of the solidified material, measured by physical and engineering tests and morphological examinations; and economic analysis, using cost information supplied by STC and the results of the SITE demonstration, the vendor's design and test data, and other laboratory and field applications of the technology. It discusses the advantages, disadvantages, and limitations, as well as estimated costs of the technology. NTIS

N93-32104*# Sandia National Labs., Albuquerque, NM. Intelligent Systems and Robotics Center.
THE TECHNOLOGY BASE FOR AGILE MANUFACTURING
R. C. Brost, D. R. Strip, and P. J. Eicker *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 66-71 Sponsored in part by DOE (For primary document see N93-32097 12-99)
(Contract DE-AC04-76DP-00789)
Avail: CASI HC A02/MF A04

N93-32110*# Air Force Civil Engineering Center, Tyndall AFB, FL. Civil Engineering Support Agency.
AIR FORCE CONSTRUCTION AUTOMATION/ROBOTICS
A. D. Nease and E. F. Alexander *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 121-130 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

32 COMMUNICATIONS AND RADAR

Includes radar; land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Space Communications, Spacecraft Communications, Command and Tracking.* For search and rescue see *03 Air Transportation and Safety,* and *16 Space Transportation.*

N93-31096 Georgia Inst. of Tech., Atlanta.
THE 1ST INTERNATIONAL CONFERENCE ON MILLIMETER WAVE AND FAR-INFRARED TECHNOLOGY Final Report, 1 Aug. 1992 - 31 Jul. 1993
R. W. McMillan Mar. 1993 715 p Conference held in Beijing, China, 17-21 Aug. 1992 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DAAL03-92-G-0324)
(AD-A264268; ARO-30430.1-PH-CF) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The International Conference on Millimeter-Wave and Far-Infrared Technology in 1992 (ICMWFT'92) is the second in the series of conferences following the highly successful ICMWFT'90 held in Beijing in June of 1990. DTIC

N93-31110*# Ohio State Univ., Columbus. ElectroScience Lab.
OPERATION OF THE HELICOPTER ANTENNA RADIATION PREDICTION CODE
E. W. Braeden, F. T. Klevenow, E. H. Newman, R. G. Rojas, K. S. Sampath, J. T. Scheik, and H. T. Shamansky Jun. 1993 111 p
(Grant NAG1-1058)
(NASA-CR-193259; NAS 1.26:193259; Rept-722792-4) Avail: CASI HC A06/MF A02

HARP is a front end as well as a back end for the AMC and NEWAIR computer codes. These codes use the Method of Moments (MM) and the Uniform Geometrical Theory of Diffraction (UTD), respectively, to calculate the electromagnetic radiation patterns for antennas on aircraft. The major difficulty in using these codes is in the creation of proper input files for particular aircraft and in verifying that these files are, in fact, what is intended. HARP creates these input files in a consistent manner and allows the user to verify them for correctness using sophisticated 2 and 3D graphics. After antenna field patterns are calculated using either MM or UTD, HARP can display the results on the user's screen or provide hardcopy output. Because the process of collecting data, building the 3D

models, and obtaining the calculated field patterns was completely automated by HARP, the researcher's productivity can be many times what it could be if these operations had to be done by hand. A complete, step by step, guide is provided so that the researcher can quickly learn to make use of all the capabilities of HARP. Author (revised)

N93-31311# Space Systems/Loral, Palo Alto, CA.
EHF MILITARY COMMUNICATION SATELLITE ALTERNATIVES STUDY Final Report
26 Feb. 1992 251 p Prepared in cooperation with Science Applications International Corp., Vienna, VA
(Contract F04701-91-C-0026)
(SS/L-TR00775) Avail: CASI HC A12/MF A03

This Draft Final Report for the EHF Military Communication Satellite Alternatives Study documents the engineering designs developed by the team of Space Systems/Loral (SS/L) and Science Applications International Corporation (SAIC). These designs address the complete spacecraft, ground terminal, and command and control system for two MILSTAR-related missions. These are a Polar Coverage Mission, and a Multi-Subscriber Equipment (MSE) Range Extension Mission. The purpose was to develop system designs for two spacecraft-based military communications systems that would address communications needs beyond those which the MILSTAR system will encompass. Derived from text

N93-31341# European Space Agency, Paris (France).
RADIATION FROM A DIPOLE ANTENNA INTO AN INHOMOGENEOUS COMPRESSIBLE AND NONLINEAR SPACE-PLASMA Ph.D. Thesis - Ruhr Univ.
Karl-Heinz Bethke (Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen, Germany.) Oct. 1992 243 p Transl. into ENGLISH of Untersuchungen zum Strahlungsverhalten einer Dipolantenne in einem inhomogene, kompressiblen und nichtlinearen Weltraumplasma (Oberpfaffenhofen, Germany, DLR), Jan. 1992 p 1-186 Original language document was announced as N92-14269
(ESA-TT-1261; DLR-FB-91-05; ETN-93-93914) Avail: CASI HC A11/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

The nonlinear plasma effects on characteristic antenna parameters are investigated. Critical threshold values for the electric field strength are derived in order to define the transition from linear to nonlinear plasma. The dipole antenna in a compressible space plasma serves as model radiator. The fundamental equations of electro and hydrodynamics are used to derive an exact integral representation for the coupled electromagnetic and electron acoustic fields via the formulation of the boundary value problem of a dipole antenna in a compressible plasma. The numerical solutions for the dipole antenna in the nonlinear plasma are performed within the framework of a perturbation computation. The formation of an ion sheath as a consequence of nonlinear antenna/plasma interactions is of particular significance here. ESA

N93-31342# European Space Agency, Paris (France).
PHASED ARRAY FOR MOBILE SATELLITE COMMUNICATIONS
Volker Ziegler (Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen, Germany.) Jan. 1993 88 p Transl. into ENGLISH of Eine Phasengesteuerte Antennengruppe fuer den Satellitenmobilfunk (Operpfaffenhofen, Germany, DLR) Nov. 1990 p 1-79 Original language document was announced as N92-21238
(ESA-TT-1280; DLR-FB-91-21; ETN-93-93918) Avail: CASI HC A05/MF A01; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

A new concept for an L band phased array antenna for mobile satellite communications is presented. The performance of the integrated array with optimized digital 4 bit switched stub phase shifters and aperture coupled right hand circularly polarized antenna elements are described. The integrated phased array developed is computer controlled via a digital interface. ESA

N93-31516# Universiteit Twente, Enschede (Netherlands). Faculty of Applied Mathematics.
ELECTROMAGNETIC RESPONSE OF A SUPERCONDUCTING WIRE OF FINITE LENGTH IN A PERPENDICULAR APPLIED AC MAGNETIC FIELD
E. M. Niessen and R. M. J. vanDamme Oct. 1992 10 p
(MEMO-1087; ETN-93-94127) Avail: CASI HC A02/MF A01

The electromagnetic response of a finite, circular, composite superconducting, twisted, multifilamentary wire (with wire axis parallel to the cylindrical z axis) is determined in a perpendicular applied AC magnetic field. The stationary electric field, the current distribution and the coupling losses are calculated. The complete problem is nonlinear due to saturation effects in the superconducting filaments. This nonlinearity is removed making use of a linear surface current. Therefore, the analysis is only valid for small saturated regions. Earlier literature considers a hollow wire represented by a current sheet. The presented analysis considers a massive wire. The coupling loss formulae derived by both methods show great resemblance: the dependence with respect to the finite length of the wire is identical. The dependence with respect to the wire radius is, however, different. Furthermore, it is shown that, considering the electric field and resulting coupling losses, the infinite length problem can be identified with the z invariant problem. This is not the case with the current profiles: they are only identical when averaged quantities over an integer number of twist lengths are considered. ESA

N93-31607 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.
DETERMINATION OF THE ELECTROSTATIC GREEN'S FUNCTION FOR STRATIFIED MEDIA [DETERMINAZIONE DELLA FUNZIONE DI GREEN ELETTROSTATICA PER MEZZI STRATIFICATI]
Gian Guido Gentili 1992 14 p In ITALIAN
(Rept-92-067; ETN-93-93997) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

The spectral electrostatic Green's function in the case of the constitutive structure of the layered dielectrics contained in a metal box is derived. The determination occurs with the typical formalism of transmission lines. The final representation addresses asymptotic analysis, arriving at a formulation suitable for studying transmission lines with spectral methods. ESA

N93-31608 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.
NUMERICAL ANALYSIS OF THE SPECTRAL DOMAIN OF TRANSMISSION LINES IN DIELECTRIC LAYERS [ANALISI NUMERICA NEL DOMINIO SPETTRALE DI LINEE DI TRASMISSIONE A DIELETTRICI STRATIFICATI]
Gian Guido Gentili 1992 12 p In ITALIAN
(Rept-92-068; ETN-93-93998) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

The numerical application of a spectral method for calculating quasi-static parameters of transmission lines in dielectric layers with negligible metallization thickness is discussed. The efficiency of the method allows the determination of impedance characteristics and effective dielectric constant with considerable accuracy. Problems associated with computation time, principally concentrating on the base function, are discussed. The implementation of the algorithm is simple, but requires preprocessing to exploit the efficiency of the spectral representation. ESA

N93-31610# Royal Signals and Radar Establishment, Malvern (England). Speech Research Unit.
A SEGMENTAL HIDDEN MARKOV MODEL FOR SPEECH PATTERN PROCESSING
Martin J. Russell 29 Jul. 1992 36 p
(RSRE-MEMO-4599; BR313437; ETN-93-94023) Copyright Avail: CASI HC A03/MF A01

A simple statistical segmental approach to speech pattern modeling, based on segmental hidden Markov models, which addresses some of the limitations of conventional hidden Markov model based methods, is proposed. The most important features of the new approach are the use of an underlying semi-Markov process to model speech at the segment level, rather than time synchronous frame level, and to enable improved segment duration modeling, and the development of a segment model in which

separate statistical processes are used to characterize extra-state and intra-state variability, thus making the temporal independence assumption more acceptable within a segment. A basic mathematical analysis of Gaussian segmental hidden Markov models is presented and model parameter reestimation equations are derived. The relationship between the new type of model and variable frame rate analysis and conventional Gaussian mixture based hidden Markov models is exposed. ESA

N93-31794 Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
ADAPTIVE ARRAY PROCESSING IN UNCERTAIN INHOMOGENEOUS MEDIA 1992-1993 Annual Report, 1 May 1992 - 30 Apr. 1993
Alan V. Oppenheim and Arthur Baggeroer 5 May 1993 8 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-91-J-1628)
(AD-A265256) Avail: CASI HC A02

This report summarizes the effort performed under the grant 'Adaptive Array Processing in Uncertain Inhomogeneous Media' during the past year. The format of the report is a compilation of the theses, presentations, and journal articles with copies of their abstracts which have been supported all or in part by the grant. The full texts have been sent to the program manager during the year as they were written. DTIC

N93-31856*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
COMBINATORIAL PULSE POSITION MODULATION FOR POWER-EFFICIENT FREE-SPACE LASER COMMUNICATIONS
James M. Budinger, M. Vanderaar (Sverdrup Technology, Inc., Brook Park, OH.), P. Wagner (Sverdrup Technology, Inc., Brook Park, OH.), and Steven Bibyk (Ohio State Univ., Columbus.) Jan. 1993 14 p Presented at the Society of Photo-Optical Instrumentation Engineers Conference, Los Angeles, CA, 16-23 1993; sponsored by the International Society for Optical Engineering
(RTOP 506-72-21)
(NASA-TM-106241; E-7961; NAS 1.15:106241) Avail: CASI HC A03/MF A01

A new modulation technique called combinatorial pulse position modulation (CPPM) is presented as a power-efficient alternative to quaternary pulse position modulation (QPPM) for direct-detection, free-space laser communications. The special case of 16C4PPM is compared to QPPM in terms of data throughput and bit error rate (BER) performance for similar laser power and pulse duty cycle requirements. The increased throughput from CPPM enables the use of forward error corrective (FEC) encoding for a net decrease in the amount of laser power required for a given data throughput compared to uncoded QPPM. A specific, practical case of coded CPPM is shown to reduce the amount of power required to transmit and receive a given data sequence by at least 4.7 dB. Hardware techniques for maximum likelihood detection and symbol timing recovery are presented. Author (revised)

N93-31861# European Space Agency, Paris (France).
EFFICIENT NUMERICAL TECHNIQUES FOR THE ANALYSIS OF COMPLEX MICROSTRIP-ANTENNAS AND MICROSTRIP-ARRAYS
Georg Splitt (Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen, Germany.) Jan. 1993 200 p Transl. into ENGLISH of Effiziente Rechenverfahren zur Analyse von komplexen Einzel-und Gruppenantennen in Streifenleitungstechnik (Oberpfaffenhoffen, Germany, DLR), Aug. 1990 p 1-154 Original language document was announced as N91-23357
(ESA-TT-1259; DLR-FB-90-53; ETN-93-94038) Avail: CASI HC A09/MF A03; Original German version available from DLR, Wissenschaftliches Berichtswensen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

Numerical techniques for analyzing microstrip antenna elements and antenna arrays are presented. Design parameters such as input impedance and bandwidth of microstrip antennas of arbitrary shape in a multilayered dielectric are obtained. Complex types of excitation and the behavior of stacked microstrip antenna elements are examined. The mutual coupling of antenna elements in an array is determined. To ensure accuracy, as few parameters as possible were neglected when compared with the real physical problem. The effects of the surface waves occurring in the layered dielectric on the characteristics of microstrip antennas were emphasized. Linear arrays consisting of nine electrodynamically coupled resonators were completely calculated. ESA

N93-31989# Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
SPACE QUALIFICATION FOR AN INTERSATELLITE LASER COMMUNICATIONS SYSTEM
Johnny A. Taylor, Allen D. Pillsbury, and Don M. Boroson 24 Mar. 1993 26 p
(Contract F19628-90-C-0002)
(AD-A265145; TR-938; ESC-TR-91-171) Avail: CASI HC A03/MF A01

The development of an optical system for space applications requires that careful attention be given to hardware design and testing. A procedure for developing and qualifying a laser intersatellite communications package is presented, along with the derivation of specific levels used in the successful testing of its transmitter assembly. This general approach may also be useful for the development of other high-reliability optical systems. DTIC

N93-32031# Army Research Lab., Aberdeen Proving Ground, MD.
TECHNIQUE FOR MEASURING THE SPIN RATE OF KINETIC ENERGY PROJECTILES Final Report, 1 Jan. 1991 - 1 Feb. 1992
Eugene M. Ferguson, Robert B. Bossoli, and Elisa A. Jara Apr. 1993 31 p
(AD-A264114; ARL-MR-60) Avail: CASI HC A03/MF A01

Kinetic energy projectiles were fitted with dihedral plugs in their tracer wells in an attempt to measure their spin histories via Doppler radar. Data from three projectiles were reduced, and the approximate steady-state spin rates were obtained. DTIC

N93-32046# Colorado Univ., Boulder. Dept. of Electrical and Computer Engineering.
AN INVESTIGATION OF THE CHANNEL CROSSTALK IN OPTICAL HETERODYNE CONTROLLED PHASED ARRAY RADARS Semiannual Report, 1 Dec. 1992 - 31 May 1993
Alan R. Mickelson 26 May 1993 6 p
(Contract N00014-92-J-1190)
(AD-A265412) Avail: CASI HC A02/MF A01

The principal objective of this project is to investigate problems associated with achieving the drive/read-out system complexity necessary to control a phased array antenna with optical heterodyne techniques. The approach has been to study the problems associated with device arrays of single sideband modulators that would be necessary to control the amplitudes and phases of all signals delivered to a phased array front end. However, recent results of closely related research, when combined with results for this project, have led to a new viewpoint of the problem. It appears that a greater degree of complexity of control can be achieved by modulating a small number of optical channels and locking them to previously self-locked array of active radiating elements. This approach promises to lead to a better system solution as well as a technical study which uncovers many new interesting problems in the computer aided analysis of nonlinear electromagnetic systems. DTIC

N93-32060# Naval Postgraduate School, Monterey, CA.
TRELLIS CODED MODULATION APPLIED TO ORTHOGONAL SIGNALS M.S. Thesis
Janet E. Stevens Mar. 1993 61 p
(AD-A265232) Avail: CASI HC A04/MF A01

A method for the design of trellis codes for coherent detection of orthogonal signals in additive white Gaussian noise (AWGN) channels is presented. This method utilizes the landmark works of Ungerboeck in trellis coded modulation (TCM). After examining the channel capacity, it is shown that a coding method requiring the same bandwidth efficiency for the orthogonal signal space and maximum likelihood (ML) soft decoding using the Viterbi algorithm can achieve large asymptotic coding gains. Several codes are analyzed using Ungerboeck's technique of set-partitioning and mapping, then applying the analytic code description method of Calderbank and Mazo to M-ary frequency shift keying (M-FSK). The general finding of this paper is that relative to uncoded modulation, asymptotic coding gains of 3-4 dB can be achieved. DTIC

N93-32065# Army Armament Research, Development and Engineering Center, Watervliet, NY. Benet Lab.
BENET IMPROVEMENTS MADE ON LOS ALAMOS ELECTROMAGNETIC FIELD CODE Final Report
Martin Leach Apr. 1993 32 p
(AD-A265474; ARCCB-TR-93013) Avail: CASI HC A03/MF A01

EMFLD-N is a self-diagnostic program that computes electromagnetic properties for general two-dimensional cross-sectional geometries. The algorithm presumes the electrical potential to be a tempered Dirac delta function; the prespecified current flows only on the surfaces of the geometric bodies. For each cross section, the code calculates the distribution of the current density and Lorentz pressure about the perimeter, and finds the impedance and resultant force vector per unit length. DTIC

N93-32210 Department of the Navy, Washington, DC.
FIX-TRACKING SYSTEM Patent
James M. Alsup, inventor (to Navy) and Edward C. Jelks, inventor (to Navy) 2 Mar. 1993 8 p Filed 6 Aug. 1981
(AD-D015738; US-Patent-5,191,342; US-Patent-Appl-SN-292767; US-Patent-Class-324-465) Avail: US Patent and Trademark Office

An apparatus determines the location of a signal source having coordinates (x, y). The source may be located as far away as two thousand km and does not require knowledge of ionospheric height or layer structure. The apparatus comprises at least three receivers adapted to receive the signals from the signal source. The coordinates, (x1, Y1), (x2, y2), and (x3, Y3), of each of the receivers are very precisely known. One receiver is capable of receiving signal from the other two receivers through different means (e.g. a wide-band telephone link). A plurality of at least three timers, one connected to each receiver, measures precisely the time difference of arrival (TDOA) of the signals from the signal source. A plurality of at least three means, connected one to each of the receiving means, determine the vertical angles at which the signal from the signal source is received by each of the receivers. More precisely, each receiver is in reality a phased array of individual antenna elements whose joint output can be used to measure both vertical angle and azimuth. Means are provided for calculating the coordinates (x, y) of the signal source from the measured vertical angles and the time differences of arrival. DTIC

N93-32283# EG and G Energy Measurements, Inc., Idaho Falls.
VIDEO CONFERENCING MADE EASY
D. G. Larsen and P. R. Schwieder 1992 7 p Presented at the NASA Technology 2002 Conference, Baltimore, Md., 1-3 Dec. 1992 Previously announced as N93-22173
(Contract DE-AC07-76ID-01570)
(DE93-010798; EGG-M-92320; CONF-921230-4) Avail: CASI HC A02/MF A01 (US Sales Only)

Network video conferencing is advancing rapidly throughout the nation, and the Idaho National Engineering Laboratory (INEL), a Department of Energy (DOE) facility, is at the forefront of the development. Engineers at INEL/EG&G designed and installed a very unique DOE video conferencing system, offering many outstanding features, that include true multipoint conferencing, user-friendly design and operation with no full-time operators required, and the potential for cost effective expansion of the system. One area where INEL/EG&G engineers made a significant contribution to video conferencing was in the development of effective, user-friendly, end station driven scheduling software. A PC at each user site is used to schedule conferences via a windows package. This software interface provides information to the users concerning conference availability, scheduling, initiation, and termination. The menus are 'mouse' controlled. Once a conference is scheduled, a workstation at the hub monitors the network to initiate all scheduled conferences. No active operator participation is required once a user schedules a conference through the local PC; the workstation automatically initiates and terminates the conference as scheduled. As each conference is scheduled, hard copy notification is also printed at each participating site. Video conferencing is the wave of the future. The use of these user-friendly systems will save millions in lost productivity and travel costs throughout the nation. The ease of operation and conference scheduling will play a key role on the extent industry uses this new technology. The INEL/EG&G has developed a prototype scheduling system for both commercial and federal government use. DOE

N93-32313# Mitre Corp., Bedford, MA.
PERFORMANCE MEASURES OF PARALLEL DIGITAL SIGNAL PROCESSOR SYSTEMS Interim Report, Sep. 1991 - Aug. 1992
Joel D. Harris Dec. 1992 54 p
(Contract F19628-89-C-0001)
(AD-A265804; MTR-11263; RL-TR-92-343) Avail: CASI HC A04/MF A01

This report summarizes a portion of the research accomplished under MITRE MOIE 7150, entitled Parallel Signal Processing. The work performed for this specific task concentrated on developing and presenting useful measures of performance for real-time parallel digital signal processor systems. Using the Common Signal Processor (CSP) as a testbed for the investigation, a three level method of measurement was followed. The results were used to evaluate the strengths and weaknesses of the CSP in processing selected applications and to provide insight into its general capability. A discussion of issues related to the process of benchmarking in general and lessons learned are also included. DTIC

N93-32414 Naval Research Lab., Washington, DC.
ANTENNA SIZE, TRANSMITTER POWER, AND SOLID STATE TRANSMITTER CONSIDERATIONS IN AFFORDABLE RADAR DESIGN
John Pavco, Max Michelson, David Alessio, and Harold Ascher 4 Apr. 1993 39 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A264397; NRL/MR/5306-93-7318) Avail: CASI HC A03

Variant radar system configurations are explored in context of reducing radar production costs. The study baseline uses the Volume Surveillance Radar concept, a long range, 3-D shipboard air surveillance radar using pulsed Doppler processing techniques. The variants adjust the relative performance of the individual radar subsystems, primarily the antenna, transmitter, and number of receiver channels. When no deterioration in the overall radar performance is permitted, the possible savings in production cost are limited to 7% except for the use of a solid state on-mount transmitter which offers a potential savings of 16%. When minor performance reductions in data rate, operating frequency bandwidth, or elevation coverage are permitted, production cost savings of up to 32% may be achieved. DTIC

N93-32425# Sandia National Labs., Albuquerque, NM.
MEASUREMENTS AND ANALYSIS OF THE EQUIVALENT CIRCUIT OF THE GEC RF REFERENCE CELL
J. T. Verdeyen (Illinois Univ., Urbana.) Sep. 1992 37 p
(Contract DE-AC04-76DP-00789)
(DE93-013498; SAND-92-7284) Avail: CASI HC A03/MF A01

The equivalent circuit of the GEC RF Reference Cell is determined by the use of a vector impedance meter and reported here. The measurement procedure and data reduction techniques are discussed and typical data are presented from which the component values are determined. Once the circuit is established, one can use it to define the ABCD parameters of the Cell which relate the terminal measurements to those at the plasma. A significant and as yet unresolved question is emphasized: namely, 'what is the path for the rf current?' An experimental procedure for answering this question is suggested, but there does not appear to be a simple 'plasma' reason for the answer. To obtain such an answer is a challenge to the experimenters and modelers. While the emphasis is on the GEC RF Reference Cell, the procedure, data reduction techniques, and 'the question' are pertinent to all reactors. DOE

N93-31284# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Inst. fuer Flugfuehrung.
INSTALLATIONS AND METHODS FOR MEASUREMENT OF AIRCRAFT RADIO COMPONENTS AND SYSTEMS
Juergen Tetzlaff *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 264-276 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 247-259 Original language document was announced as N92-25603 (For primary document see N93-31271 12-04)
Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

N93-31711# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
MIRROR MODE AND OTHER COMPRESSIVE ULF MODES
G. Belmont, D. Hubert (Observatoire de Paris-Meudon, France.), C. Lacombe (Observatoire de Paris-Meudon, France.), and F. Pantellini (Observatoire de Paris-Meudon, France.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 263-267 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-32114*# Oak Ridge National Lab., TN. Robotics and Process Systems Div.
REMOTE DRIVING WITH REDUCED BANDWIDTH COMMUNICATION
Frederick W. DePiero, Timothy E. Noell, and Timothy F. Gee *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 163-171 Previously announced as N93-16408 Sponsored in part by USA and DOE (For primary document see N93-32097 12-99)
(Contract DE-AC05-84OR-21400)
Avail: CASI HC A02/MF A04

N93-32145*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROCESS CONTROL AND RECOVERY IN THE LINK MONITOR AND CONTROL OPERATOR ASSISTANT
Lorrine Lee and Randall W. Hill, Jr. *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 355-362 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N93-31080# Stanford Univ., CA. Center for Integrated Systems.
LOW VOLTAGE ELECTRON BEAM LITHOGRAPHY Monthly Report
R. Browning and R. F. Pease Oct. 1992 5 p
(Contract N00014-92-J-1996)
(AD-A263360) Avail: CASI HC A01/MF A01

The contract has three parts covering aspects of high precision electron beam lithography: (1) Comprehensive computer modelling of the electron beam tool; (2) Experimental determination of the properties of sources, columns, and targets; and (3) The use of silicon single crystals as straightness and orthogonality standards using orientation dependent etching techniques. DTIC

N93-31085# Naval Surface Warfare Center, Dahlgren, VA.
TRACKING FILTERS FOR PRECISION ELECTRONIC SUPPORT MEASURES (ESM) SYSTEMS
Dec. 1992 132 p
(AD-A264089; NSWCDD/TR-92/503) Avail: CASI HC A07/MF A02

Both an alpha,beta and an alpha,beta,gamma filter were used to estimate the true bearing and elevation of high-speed maneuvering targets from measurements made by a shipboard electronic support measures (ESM) sensor. The motivation for this research is the need for correlating radar and ESM tracks. Four Mach 3 target trajectories with a data rate of 10 Hz and a measurement noise standard deviation of 0.1 deg were used to test the filters. Consistency tests were used to determine the best values for the steady-state gains of the filters. Both filters are computationally simple and provide estimates of greater accuracy than the ESM measurements. It was determined that an alpha,beta filter provides better estimates than an alpha,beta,gamma filter for most of the tested target trajectories. Two exceptions are the bearing for a Mach 3 crossing target at ranges less than 20 km and the elevation of a Mach 3 target at ranges less than 5 km. Both filters are recommended for radar-to-ESM track correlation research. The alpha,beta filter should be tested first, since it is simpler and provides better estimates for most of the cases tested. DTIC

N93-31173# Laboratoire d'Automatique et d'Analyse des Systemes, Toulouse (France). Groupe Circuits et Composants Micro-Ondes.
SYNTHESIS AND REALIZATION OF A MONOLITHIC ACTIVE BANDPASS FILTER FOR THE Ku BAND Ph.D. Thesis - Toulouse Univ. [SYNTHESE ET REALISATION D'UN FILTRE ACTIF PASSE-BANDE TRANSVERSAL MONOLITHIQUE EN BAND KU]
Christine Galy 1992 134 p In FRENCH Prepared in cooperation with Alcatel Espace, Toulouse, France
(LAAS-92365; ETN-93-94236) Avail: CASI HC A07/MF A02

The synthesis of an active bandpass filter for use in the Ku band and implementation on gallium arsenide substrate are presented. Based on a polynomial structure this filter shows transmission zeros brought about by MESFETS used as transversal elements. This large band pseudo elliptic filter was processed in foundry. The synthesis technique of the filtering structure, the analysis, conception and realization of a filter centered at 11.7 Ghz are presented. Different computer aided microwave simulation programs were used in the different phases of the investigations. A new dedicated program permits an easy calculation of the different sections of the circuit. The two fundamental points of the applied method are: a simple construction and reproducibility of the circuit ensures performance stability, lumped elements make original the circuit and imply a direct application of the theoretical calculations. Experimental results, obtained on some of the processed chips through a microwave probe station, are discussed. They show rejection at two transmission zeros in good agreement with theoretical predictions. Perspectives for the industrialization phase bring a conclusion about the possibilities of the use of this type of filter on telecommunication receivers. ESA

N93-31253 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.
PULSE DISCRIMINATOR FOR CROSSTALK REJECTION IN A MULTI-CHANNEL ISOCHROMAT PHOTOEMISSION SPECTROSCOPY
Giuseppe Bertuccio and Elio Vescovo Jul. 1992 6 p
(Rept-92-062; ETN-93-93994) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

A pulse discriminator designed to reduce the interchannel crosstalk effects in an inverse photoemission spectrograph is presented. The design criteria and performances are reported. This discriminator has high sensitivity, a wide range threshold level and it can drive a pulse counter up to 2 MHz counting rate. The device is designed with TTL commercially standard integrated circuits. The spectrograph's electronics are also described. ESA

N93-31462# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany). Abt. Steuerung und Regelung.
PULSE-MODULATED CONTROL OF SWITCHING VALVES FOR AN ELECTRO-HYDRAULIC SERVO ACTUATOR [PULSMODULIERTE ANSTEUERUNG VON SCHALTVENTILEN EINES ELEKTRO-HYDRAULISCHEN POSITIONIERANTRIEBES]
Johannes Tersteegen Feb. 1992 67 p In GERMAN
(DLR-FB-92-18; ETN-93-93736) Avail: CASI HC A04/MF A01; DLR, VB-PL-D O, Postfach 90 60 58, 5000 Cologne, Germany, HC

The consequent step in using digital technology in servohydraulics leads to the use of fast switching electrohydraulic control valves. By changing the pulse duty ratio between opening and closing (pulse width modulation) a quasi-continuous control of the fluid flow can be achieved. The essential design criteria of a valve controlled actuator including the pulse modulated closed loop position control are described. Those computer programs which are dealt with in detail include the digital control circuit with its pulse modulated control as well as fault detection and fault elimination. ESA

N93-31475# Centre National d'Etudes Spatiales, Toulouse (France).
PROTECTION AND REGULATION ON DIRECT-DIRECT CHOPPING CONVERTERS [PROTECTION ET REGULATION SUR LES CONVERTISSEURS CONTINU-CONTINU A DECOUPAGE]
Alphonse Barnaba Jan. 1992 108 p In FRENCH
(CNES-NT-129; ETN-93-93731) Copyright Avail: CASI HC A06/MF A02

The mathematical modeling of current protection and voltage regulation systems with different types of switching cells such as buck, boost, flyback, forward and current fed DC/DC converters is presented. Two original current sensors are also studied: they are used in the regulation and the protection of current loops. Their implementation and the associated test results are shown. ESA

N93-31536# Technical Research Centre of Finland, Espoo. Electrical and Automation Engineering Lab.

TRANSIENT ANALYSIS FOR GROUND FAULT DISTANCE ESTIMATION IN ELECTRICAL DISTRIBUTION NETWORKS Ph.D. Thesis - Tampere Univ. of Technology

Matti Lehtonen Oct. 1992 269 p Sponsored by Stroemberg Industry/Automation, Vaasa, Finland; Academy of Finland; and Technical Research Centre of Finland, Espoo

(VTT-PUBS-115; ISBN-9-51-384233-9; ETN-93-94022) Copyright Avail: CASI HC A12/MF A03

Post fault transient analysis for single phase to ground fault distance estimation in electrical distribution networks is discussed. The networks are assumed to be radially operated, and the neutral either isolated or compensated. The composition of ground fault transients (charge, discharge, and interline compensating components) is discussed. For transient analysis, a two frequency model which takes into account the interdependence of charge and discharge components is introduced. According to the theory, the charge transient, which is primarily due to the voltage rise of the two fault free phases, is most suitable for fault location, since it is the lowest in frequency and in most cases also the largest in amplitude. Of the various factors affecting the transients, fault resistance and loads were found to be the most important ones. When the magnitude of these is increased, the transients become damped, which makes their parameter identification difficult. Load impedances can also cause large errors to the distance estimates, although the parameters were identified accurately. Of significance also is the fault moment. If the instantaneous voltage is zero, the transient amplitudes are smaller than that of the uncompensated fundamental frequency fault current. Errors of measurement transformers are discussed, and models proposed for the analysis of their transient response. From the other error sources, the effect of fault arc nonlinearity was studied using a simulation model. ESA

N93-31609 Politecnico di Milano (Italy). Dipt. di Elettronica.

CHARACTERISTICS AND PROPERTIES OF THE CONTINUITY EQUATIONS IN A SEMICONDUCTOR [CARATTERISTICHE E PROPRIETA DELL'EQUAZIONE DI CONTINUITA IN UN SEMICONDUTTORE]

F. E. Zocchi Nov. 1992 13 p In ITALIAN

(Rept-92-080; ETN-93-94003) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

Results concerning the continuity equations for electrons in a semiconductor in the case of drift-diffusion approximation used to describe transport phenomena are presented. Distribution of electrons is modeled. The Green's function, transport Green's function, and a symmetrical Green's function are shown. ESA

N93-31825# Korean Atomic Energy Research Inst., Daeduk (Republic of Korea).

A STUDY ON THE DEVELOPMENT OF HIGH T(SUB c) SUPERCONDUCTING MATERIALS

D. Y. Won, G. Y. Hong, H. G. Lee, H. J. Lee, C. J. Kim, S. C. Kwon, K. B. Kim, Y. H. Kang, I. S. Chang, and M. J. Choi Jan. 1992 89 p In KOREAN

(DE93-606394; KAERI/RR-1044/91) Avail: CASI HC A05/MF A01 (US Sales Only)

The major work of this project aims to develop the frictionless superconducting bearing with a high speed. The high magnetization YBaCuO bulk superconductor was prepared by Quasi-melt process. The frictionless superconducting magnetic bearing withstood a rotating bar with a speed of 75,000 rpm, which was operated by an electric controller. The low temperature chemical vapor deposition technique was developed. YBaCuO superconducting film showing a superconductivity above 77K was successfully prepared at 650 deg C. Effect of oxygen partial pressure, substrate, and deposition temperature on the film properties were also investigated. DOE

N93-31842 Department of the Navy, Washington, DC.

NOISE ATTENUATING CIRCUIT FOR MECHANICAL RELAY INCLUDING OPTICAL ISOLATION Patent

Dale L. Beezley, inventor (to Navy) 26 Jan. 1993 4 p Filed 25 Feb. 1992

(AD-D015700; US-Patent-5,182,456; US-Patent-Appl-SN-841606; US-Patent-Class-250-551) Avail: US Patent and Trademark Office

An electrical noise reduction circuit is presented which includes field-effect transistors and a photocoupler, for use in alternating current circuits in conjunction with an electro-mechanical relay. The circuit essentially reduces the function of the electromechanical relay to that of a safety block, the function of contact closing being taken over by the time-delayed semiconductor devices of the noise reduction circuit. DTIC

N93-31862# Technical Research Centre of Finland, Espoo. Fuel and Process Technology Lab.

NEW ALTERNATIVE FOR ELECTRICITY PRODUCTION. PART 3: ELECTRICITY PRODUCTION FROM BIOMASS AND NATURAL GAS BY A SOLID OXIDE FUEL CELL [SAEHKOENTUOTANNON UUDET VAIHTOEHDOT. OSA 3: SAEHKOENTUOTANTO BIOMASSASTA JA MAAKASUSTA KIINTEAEOKSIDIPOLTTOKENNOLLA]

Tuula Maekinen, Jukka Leppaelahti, Esa Kurkela, and Yrjoe Solantausta Sep. 1992 58 p In FINNISH

(VTT-TIED-1397; ISBN-9-51-384211-8; ETN-93-94015) Copyright Avail: CASI HC A04/MF A01

Solid oxide cells of different kinds are being tested primarily on a laboratory scale. A tube cell has already been tested and the experience obtained has been promising. The efficiency of the equipment used in the tests was 3 kW. The aim is to construct plants of 100 to 200 kW by the year 1996. These plants could be used as a basis for future power plant concepts. In planar cells and in a monolithic cell the losses can be significantly lower and the power density higher than in a tube cell construction. The efficiencies of these cells have so far been only 100 to 200 W in laboratory tests. The development of solid oxide cells to a power plant size class requires materials superior to the present cell materials and the development of the manufacturing technology of cell components. Efficiency assessments of three power plant processes based on the solid oxide fuel cell were carried out. Two of the processes are based on fluidized bed air gasification of wood and one on the use of natural gas. A combined cycle process based on pressurized fluidized bed air gasification of wood and a natural gas combined cycle process were used as references. The effect of two fuel cell parameters, the utilization ratio of fuel and the voltage of the cell, on the operation of the processes was studied. By connecting the fuel cell as a part to the combined cycle power plant process the electric efficiency and construction degree of the power plant processes was increased significantly. The efficiency of the fuel cell process based on pressurized gasification of wood was about 10 percentage units higher than that without the fuel cell. The improvement in the efficiency of the natural gas process was more than 20 percentage units. The electric efficiency of the natural gas process was about 70%. ESA

N93-31876# Analytic Power Corp., Boston, MA.

ELECTROPNEUMATIC ACTUATOR, PHASE 1

D. P. Bloomfield 26 Oct. 1989 37 p Sponsored by NSF, Washington, DC

(Grant NSF ISI-88-60898)

(PB93-174951; NSF/ISI-89032) Avail: CASI HC A03/MF A01

The program demonstrated the feasibility of an electropneumatic actuator which can be used in manufacturing applications. The electropneumatic actuator, an alternative to the electric, hydraulic, and pneumatic actuators used in industry, consists of an electrochemical compressor, a power supply, and an actuator. The electrochemical compressor working fluid is hydrogen and a solvent such as water or ammonia. The compressor has no moving parts and runs on low voltage DC. The actuator is a conventional, commercially available unit. Researchers designed, constructed, and tested the electrochemical compressor in conjunction with the actuator, power supply, and computerized control. The one inch actuator can lift a fifty pound weight a distance of ten inches in about 1.5 minutes. The electrochemically powered system is capable of driving its loaded actuator to a prescribed location at a controlled rate. A defined set of design changes will combine the compressor and actuator in the same housing,

and will develop two orders of magnitude increased actuator speed at the same or higher force levels. NTIS

N93-31984# George Mason Univ., Fairfax, VA.
DLTS AND DYNAMIC TRANSCONDUCTANCE ANALYSIS OF DEEP-SUBMICRON FULLY-DEPLETED SOI MOSFETS Quarterly Report, 1 Jan. - 31 Mar. 1993
Dimitris E. Ioannou 31 Mar. 1993 19 p
(Contract N00014-91-J-1441)
(AD-A264888) Avail: CASI HC A03/MF A01

An experimental study of the degradation mechanisms of hot-carrier stressed SOI (SIMOX) MOSFET's is carried out. Depending on the applied stress conditions, it is found that device degradation is mainly caused by electron and hole trapping by intrinsic and generated oxide traps and/or by generation of interface states. Sequential hot-electron stressing of the front/back channels results in successive electron/hole injection in the gate oxides, leading to important insights on the nature of the degradation mechanisms. DTIC

N93-31994# North Carolina Univ., Chapel Hill. Dept. of Chemistry.
INVESTIGATION OF TRAP EMISSION KINETICS MOS CAPACITORS USING A PUMP-PROBE CHARGE INTEGRATING TECHNIQUE
J. C. Poler and E. A. Irene 4 May 1993 31 p
(Contract N00014-89-J-1178)
(AD-A265198; TR-50) Avail: CASI HC A03/MF A01

We have developed a Pump-Probe charge integrating measurement technique for studying the emission kinetics of traps in the M/SiO2/Si system. Essentially, an MOS capacitor is pumped by exposure to a charging pulse. The emission of the charge at short time scales (less than 10 ms), can be measured using a delayed application of a probe pulse, that determines the remainder of the filled traps as a function of delay time. For MOS capacitors grown on a lightly doped p-Si (111) substrate, we observe an uncommon behavior of the emission kinetics in the initial time regime (less than 100 ms). A possible explanation for this phenomena is the perturbation of the emission cross-section of the probed traps due to the presence of another state in communication with the trap site. Our results on this system will be presented along with a comparison to other substrate types and processing parameters. DTIC

N93-32001# Pennsylvania State Univ., University Park. Dept. of Chemistry.
CHARACTERIZATION OF SMALL NOBLE METAL ELECTRODES BY VOLTAMMETRY AND ENERGY DISPERSIVE X RAY ANALYSIS Technical Report
Timothy G. Strein and Andrew G. Ewing 26 Jan. 1993 34 p
(Contract N00014-90-J-1161)
(AD-A265208; TR-014) Avail: CASI HC A03/MF A01

Construction and characterization of platinum and gold electrodes with total structural diameters of 1-2 micrometers is described. These small voltammetric probes have been constructed by direct electroreduction of noble metals onto the tips of etched carbon fiber microdisk electrodes. Voltammetry, electron microscopy, energy-dispersive x-ray analysis, and pulsed amperometric detection have been used to characterize these electrodes. Dopamine concentrations have been determined over a range of 10(exp -4) to 10(exp -3) M in the biological buffer system which contains 25 mM glucose, a compound known to adsorb strongly to electrodes. Amperometric monitoring at a constant potential with these small results in signal decay of 20% to 40% in a ten minute experiment. Pulsed amperometric detection minimizes electrode fouling, resulting in 5% or less signal decay over the same ten minute period. DTIC

N93-32033 Honeywell, Inc., Bloomington, MN. Sensor and System Development Center.
R AND D STATUS REPORT: RF VACUUM MICROELECTRONICS Quarterly Progress Report No. 5, 1 Oct. - 31 Mar. 1993
David K. Arch 6 Apr. 1993 12 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract MDA972-91-C-0030)
(AD-A264381) Avail: CASI HC A03

We summarize our sixth quarter progress towards developing a thin-film-edge, emitter vacuum transistor capable of 1 GHz modulation for sustained (greater than 1 hour) periods of time. We completed extensive DC characterization of the completed devices. We also performed low frequency modulation tests of the vacuum transistors at 10-100 KHz. We designed a vacuum feedthrough with high frequency probes for testing vacuum transistors at 2-4 GHz (BNC connectors) and 10-12 GHz (SMA connectors). A program review was held at the conclusion of the baseline phase. We also replanned the option phase of the program with a goal of obtaining vacuum transistors that have 1 GHz modulation with gain. DTIC

N93-32055# Nihon Univ., Tokyo (Japan). Coll. of Industrial Technology.
AFFECTING FACTORS TO THE ELECTRICAL PROPERTIES OF RuO2 THICK-FILM RESISTORS
O. Abe and Y. Taketa Dec. 1991 19 p
(DE93-768332; ETDE/JP-mf-93768332) Avail: CASI HC A03/MF A01

In order to obtain knowledge to manufacture RuO2 thick-film resistors having resistance and the TCR controlled closely to the required value, RuO2 thick-film resistors were prepared with different variables, including various conductive particle sizes, glass particle sizes, thermal expansion coefficients of the glass, mixing ratios of the conductive element and glass, and additives, et al. Then the relation between these factors and electrical properties of the thick-film resistors was studied in experiments. As a result, it was found that when a special glass is chosen, its R-TCR curve is unconditionally fixed regardless of various preparation factors, and the R-TCR curve can be moved only by changing the thermal expansion coefficient of the glass. Then, oxides of various elements were added to RuO2 thick-film resistors and the electrical properties of the resultant resistors were examined. It was clarified that almost all the oxides of transition metals, rare earths, and antimony used as additives can closely control the resistivity and TCR of the resistors to obtain a required value. In addition, it was clarified that the principle of superposition applies to the additives. DOE

N93-32079# Naval Surface Warfare Center, Dahlgren, VA.
DEINTERLEAVER TECHNOLOGY FOR FUTURE ELECTRONIC SUPPORT MEASURES (ESM) SYSTEMS
J. D. Parker Dec. 1992 26 p
(AD-A265005; NSWCDD/MP-92/547) Avail: CASI HC A03/MF A01

The precision electronic support measures (ESM) systems of the future must operate in dense environments of emitters that have agility in several parameters. A deinterleaving system that would be capable of processing the pulse data generated by a future precision ESM receiver is described at the block diagram level. To be effective in a dense environment of agile emitters, the deinterleaving system will need adaptable pulse data filters to eliminate the data from friendly emitters, a processor dedicated to sorting the pulse data from new and high-priority emitters by angle-of-arrival and frequency, and sophisticated, multiparameter deinterleaving algorithms. A summary of research related to ESM processing is given. DTIC

N93-32174# Ceramatec, Inc., Salt Lake City, UT. Inst. of Gas Technology.
ADVANCED ALTERNATE PLANAR GEOMETRY SOLID OXIDE FUEL CELLS
S. Elangovan, D. Prouse, A. Khandkar, R. Donelson, and L. Marianowski Nov. 1992 83 p
(Contract DE-AC21-88MC-25168)
(DE93-000248; DOE/MC-25168/3291) Avail: CASI HC A05/MF A01

The potential of high temperature Solid Oxide Fuel Cells (SOFC) as high performance, high efficiency energy conversion devices is well known. Investigation of several cell designs have been undertaken by various researchers to derive the maximum performance benefit from the device while maintaining a lower cost of production to meet the commercialization cost target. The present investigation focused on the planar SOFC design which allows for the use of mature low cost production processes. A novel design concept was investigated which allows for the following: improvements in performance through increased interface stability, and lowering of cost through enhanced structural integrity and the use of low cost metal interconnects. The new cell design consisted of a co-sintered porous/dense/porous zirconia layer with the electrode material infiltrated into the porous layers. The two year program conducted by a team involving Ceramatec and the Institute of Gas Technology culminated in a multi-cell stack test that exhibited high performance. Considerable progress was achieved in the selection of cell components and establishing and optimizing the cell and stack fabrication parameters. It was shown that the stack

components exhibited high conductivities and low creep at the operating temperature. The inter-cell resistive losses were shown to be small through out-of-cell characterization. The source of performance loss was identified to be the anode electrolyte interface. This loss however can be minimized by improving the anode infiltration technique. Manifolding and sealing of the planar devices posed considerable challenge. Even though the open circuit voltage was 250 mV/cell lower than theoretical, the two cell stack had a performance of 300 mA/sq cm at 0.4V/cell with an area specific resistance of 1 Ohm-sq cm/cell. Improvements in manifolding are expected to provide much higher performance. DOE

N93-32207 Department of the Navy, Washington, DC.
OPTICALLY POWERED PHOTOMULTIPLIER TUBE Patent
Larry D. Flesner, inventor (to Navy), Stephen A. Miller, inventor (to Navy), and Wadad B. Dubbelday, inventor (to Navy) 23 Mar. 1993 16 p Filed 18 Jun. 1991
(AD-D015735; US-Patent-5,196,690; US-Patent-Appl-SN-721844; US-Patent-Class-250-207) Avail: US Patent and Trademark Office

An optically powered photomultiplier tube is provided, comprising a vacuum chamber having a window for incident optical radiation which is to be detected. Also described are a photocathode to receive the optical radiation; an electron multiplier system within the chamber to amplify the electron current from the photocathode; an anode to receive the amplified electron current; a high voltage photocell array positioned within the chamber for generating high voltage electrical power that is provided to the electron multiplier system; a system for delivering optical power to the photocell array; a first electrical contact penetrating the container in a vacuum tight manner and operably coupled to the anode; and a second electrical contact penetrating the container in a vacuum tight manner and operably coupled to the photocell array. DTIC

N93-32214# Polish Academy of Sciences, Warsaw.
STEADY STATES IN THE TWIN-WELL POTENTIAL OSCILLATOR: COMPUTER SIMULATIONS AND APPROXIMATE ANALYTICAL STUDIES
Wanda Szemplinska-Stupnicka, Jerzy Rudowski, and Samodzielna Pracowni Stosowanej 1992 51 p
(Rept-40/1992) Avail: CASI HC A04/MF A01

The paper is focused on the phenomena of various steady state oscillations exhibited by the twin-well potential system. Regions of existence of different attractors in the system parameter domain are examined and a picture book of different steady states for fixed damping and forcing is presented: 20 different combinations of single or coexisting, Small Orbit or Large Orbit, periodic and chaotic attractors are displayed. Computer simulations are followed by an approximate analytical analysis: a study of various forms of instability of periodic solutions gives close form approximate criteria for occurrence of T-periodic Small Orbit and Large Orbit oscillations, and for cross-well chaos. Author

N93-32422# Royal Aerospace Establishment, Farnborough (England).
THERMAL STABILITY OF LITHIATED VANADIUM OXIDE (LVO), GAMMA-LITHIUM VANADIUM BRONZE (GAMMA-LiV2O5) AND VANADIUM DIOXIDE (VO2) THERMAL BATTERY CATHODE MATERIALS
A. G. Ritchie and J. C. Bryce Aug. 1992 46 p
(RAE-TR-92047; RAE-MAT/STR-357; BR314271; ETN-93-94027)
Copyright Avail: CASI HC A03/MF A01

Thermal analysis of lithiated vanadium oxide (LVO) has shown that it has limited thermal stability, possibly accounting for the failure of some thermal batteries with LVO cathodes. Its minor component, gamma-LiV2O5, melts at temperatures which could be reached during thermal battery activation. The major component of LVO, VO2, is thermally stable on its own, but can react with lithium chloride-potassium chloride binary eutectic when heated for prolonged periods above 700 C, though VO2/binary eutectic mixtures should be sufficiently stable for use in thermal batteries. ESA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N93-31053# Aeronautical Research Inst. of Sweden, Stockholm.
MODAL SYNTHESIS TECHNIQUE USED IN SHALLOW DOUBLEWALL
Karin Ek Oct. 1992 73 p Sponsored by Swedish National Board for Industrial and Technical Development
(FFA-TN-1992-29; ETN-93-94215) Avail: CASI HC A04/MF A01

A two dimensional finite element (FE) model of a narrow duct covered with structure in the long sides, such as a rather shallow doublewall is studied. Eigenvalues and eigenforms are calculated using the local synthesis technique. To get a convergent solution the modal base has to be complete, the modal base must contain all uncoupled eigenmodes from the cavity and structure which are needed for describing the coupled system. In the concept of completeness lies also that the eigenmodes must be calculated with sufficient precision. If Lx/Ly (width of duct/length of duct) is approximately equal to 1 the boundary condition of the flexible boundary is given by a combination of the boundary condition of the rigid wall and $p = 0$ on the flexible boundary in the fluid part of the model. When Lx/Ly is greater than 0 the boundary condition $p = 0$ on the flexible boundary is split into two net versions. Each version is with $p = 0$ on one of the flexible boundaries. The frequency range used when solving the eigenvalue problem of the uncoupled fluid net versions must be of such width that eigenforms of the type L/2 in both x and y direction are received. The eigenfrequencies seem to converge much faster than the eigenforms. It is therefore impossible to decide if a convergent solution is received only by studying the frequencies. The most important conclusion from this is that both the eigenfrequencies and the eigenforms must be taken into account. ESA

N93-31114 Maryland Univ., College Park. Dept. of Mechanical Engineering.
TRANSIENT COOLING OF A HOT SURFACE BY DROPLETS EVAPORATION Final Report, Nov. 1990
P. Tartarini, Y. Liao, and M. diMarzo Apr. 1993 104 p See also PB90-227968 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant NANB-8H0840)
(PB93-189421; NIST/GCR-93/622) Avail: CASI HC A06

A new experimental set-up for the study of dropwise evaporation in a radiant heat transfer field has been designed, constructed and tested. The various issues of concern such as: steady state solid temperature distribution, radiant heater design and configuration, infrared background noise and post test data manipulation are outlined. The formulation of a model for the prediction of the cooling induced by an evaporating droplet impinging a semi-infinite solid is the subject of the report. A combined Boundary Element Method (BEM) and Control Volume Method (CVM) has been used to solve this complex numerical problem. The results for both high and low thermal conductivity materials are in excellent agreement with the experimental findings. Detailed comparison of the surface temperature distributions on solid Macor detected with infrared thermography are also performed to demonstrate the accuracy of the computational method. NTIS

N93-31124# Oxford Univ. (England). Dept. of Engineering Science.
AN EXPERIMENTAL STUDY OF UNDER-EXPANDED JETS Thesis
Terrence M. Cain 1992 146 p Sponsored by Ministry of Defence Procurement Executive, London, England
(OUEL-1959/92; ETN-93-94231) Avail: CASI HC A07/MF A01

The results of an experiment conducted in turbulent underexpanded jets of nitrogen and carbon dioxide exhausted into still air from Mach 3 and Mach 5 conical nozzles are reported. The ratio of the stagnation pressure in the nozzle to the static pressure in the receiving tank was of the order 1000 which is a condition representative of rocket exhaust plumes generated at altitudes near 20 km. The Oxford gun tunnel was adapted for the project by attaching a small nozzle to its barrel. Jets were generated in the tunnel's test section, photographed with a schlieren system and

traversed by a Pitot probe. The traverse mechanisms developed allow 100 mm travel during the period of 20 ms over which the tunnel stagnation pressure is constant. Methods of increasing this steady period by modification of the tunnel's driver tube are suggested. The characteristics of underexpanded jets are summarized and available experimental data is reviewed and classified using recently published plume similarity parameters. The asymmetrical nature of plumes is discussed and a physical explanation for pulse shock layer instability is given. Condensation of the plume gas is investigated. It is shown that it is unlikely that condensation occurred anywhere within the nitrogen plumes as drop growth rates are negligible at high entropy. Method of characteristics calculations of the initial plume expansion were compared with the Pitot measurements in the plume core. Variation of the nozzle exit conditions used for the boundary conditions of the method of characteristics predictions is used to demonstrate that viscous and two dimensional effects within the nozzle were not very significant in these experiments. ESA

N93-31146# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.

WBNFLOW: MULTI-GRID/MULTI-BLOCK POTENTIAL SOLVER FOR COMPRESSIBLE FLOW. USER'S GUIDE

Wang Diegian Dec. 1992 16 p

(Contract NUTEK-92-01540P)

(FFA-TN-1992-43; ETN-93-94220) Avail: CASI HC A03/MF A01

The user manual for the flow solver WBNFLOW, a code that computes a full potential solution around wing/body/nacelle configurations including a propeller slipstream, is presented. The code is written in FORTRAN-77. The method for solution is based on the full approximation storage multigrid method using both the incomplete lower upper decomposition and the strongly implicit procedure as the smoothing algorithm. The code is very competitive in terms of computational efficiency. Topology, freestream conditions, slipstream condition, and computational parameters are all specified in input files. The code has capability to handle variations in these. There are two codes to prepare the main input files. One is a code JOBPRE1 to generate an input file including the freestream condition, the organization of the cycle for running the solution on a sequence of grids, and also some parameters. Another is a code WBNGRID to generate the grid input file for this code. When the user executes WBNFLOW, the input files are analyzed and obvious errors are fed out in an output file. Output files also contain configuration surface pressure distributions, number of supersonic points in the flow field, and convergence history. ESA

N93-31147*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

NUMERICAL SIMULATIONS OF THREE-DIMENSIONAL LAMINAR FLOW OVER A BACKWARD FACING STEP; FLOW NEAR SIDE WALLS

Erlendur Steinthorsson, Meng-Sing Liou, Louis A. Povinelli, and Andrea Arnone Jul. 1993 10 p Presented at the 1993 ASME Fluids Engineering Division Summer Meeting Symposium on Separated Flows, Washington, DC, 20-24 Jun. 1993; sponsored by ASME

(Contract NCC3-233; RTOP 505-90-5K)

(NASA-TM-106248; ICOMP-93-21; E-7970; NAS 1.15:106248) Avail: CASI HC A02/MF A01

This paper reports the results of numerical simulations of steady, laminar flow over a backward-facing step. The governing equations used in the simulations are the full 'compressible' Navier-Stokes equations, solutions to which were computed by using a cell-centered, finite volume discretization. The convection terms of the governing equations were discretized by using the Advection Upwind Splitting Method (AUSM), whereas the diffusion terms were discretized using central differencing formulas. The validity and accuracy of the numerical solutions were verified by comparing the results to existing experimental data for flow at identical Reynolds numbers in the same back step geometry. The paper focuses attention on the details of the flow field near the side wall of the geometry. Author

N93-31169# Sandia National Labs., Albuquerque, NM.

F2D: A TWO-DIMENSIONAL COMPRESSIBLE GAS FLOW CODE

A. Suo-Anttila (Science Applications International Corp., Albuquerque, NM.) 11 Sep. 1992 12 p Presented at the 10th Symposium on Space Nuclear Power and Propulsion, Albuquerque, NM, 10-14 Jan. 1993

(Contract DE-AC04-76DP-00789)

(DE93-003239; SAND-92-7295C; CONF-930103-20) Avail: CASI HC A03/MF A01 (US Sales Only)

The F2D computer code is a general-purpose, two-dimensional, fully compressible thermal-fluids code that models most phenomena found in experimental environments with coupled fluid flow and heat transfer. The code solves momentum, continuity, gas energy, and structure energy equations, simultaneously utilizing a predictor-corrector solution algorithm. The F2D code applied to a particle-bed reactor operating at 5 MW/L with a flow-control cold frit, revealed a skew in the temperature contours caused by two-dimensional flow effects. A thermal-fluid stability analysis of particle-bed and NERVA type reactors reveals similar behavior for the stability threshold. DOE

N93-31204# New Mexico Inst. of Mining and Technology, Socorro.

PREFERENTIAL FLOW EFFECTS ON CHEMICAL TRANSPORT AND RETARDATION IN SOILS Technical Completion Report

K. Economy and R. S. Bowman Nov. 1992 109 p

(Contract DI-14-08-0001-G1578-02)

(PB93-190668; Technical-Completion-272) Avail: CASI HC A06/MF A02

The study's objective was to investigate the presence of preferential flow and its affect on the transport of a conservative tracer, m-trifluoromethylbenzoic acid (m-TFMBA), and a mildly retarded tracer, 5-bromo-3-sec butyl-6-methyluracil, (bromacil) through two in situ and two repacked soil columns. All columns were of the same bulk density and soil type. Each measured 15-cm in diameter by 32-cm high. Soil in the in situ columns showed no visible cracks or macropores. A comparison of the degree of preferential flow between steady state unsaturated and intermittent ponding flow regimes was investigated. Study results lead to three deductions. One, that preferential flow is highly possible in a seemingly structureless soil profile during steady state-unsaturated flow and intermittent ponding and therefore solute transport may be underestimated using conventional transport models. Two, due to the presence of preferential flow and the time interval between ponding events, intermittent ponding can be less effective that steady state-unsaturated flow in flushing surface-applied salts out of a homogenous soil profile. NTIS

N93-31210# California Univ., Los Angeles. Dept. of Mechanical, Aerospace and Nuclear Engineering.

ENHANCEMENT OF SINGLE PHASE FORCED CONVECTION HEAT TRANSFER IN TUBES AND DUCTS USING TANGENTIAL FLOW INJECTION Annual Report, Jul. 1991 - Jun. 1992

V. K. Dhir, F. Chang, and G. Son Aug. 1992 150 p See also PB90-247594

(Contract GRI-5087-260-1535)

(PB93-189975; GRI-92/0293) Avail: CASI HC A07/MF A02

Enhancement of heat transfer is needed to improve the performance of a variety of heat exchanger equipment. Such enhancement, achieved without increasing initial costs, is shown to be obtainable with swirl flow introduced by manifold type of tangential injection of the fluid through a chamber. Different designs of equipment and different flow models are compared. Experiments to reduce pumping power by inserting stators at the tube inlet identified a type of stator in combination of six injectors which provides a better design for tubes longer than 53 hydraulic diameters. NTIS

N93-31245# Universidad Autonoma Metropolitana de Mexico (Mexico). Unidad Azcapotzalco.

TERMINAL PROJECT HEAT CONVECTION IN THIN CYLINDERS

Corona J. Morales 1992 95 p

(DE93-609489; INIS-mf-13392) Avail: CASI HC A05/MF A01 (US Sales Only)

Heat convection in thin cylinders and analysis about natural convection for straight vertical plates, and straight vertical cylinders submersed in a fluid are discussed. In the part of conduction, deduction of the equation of heat conduction in cylindrical coordinates by means of energy balance in a control volume is presented. Enthalpy and internal energy are used for the outlining of the equation and finally the equation in its vectorial form is obtained. In the convection part development to calculate the Nusselt number for a straight vertical plate by a forced analysis, an energy balance and mass conservation over a control volume is outlined. Several empirical correlations to calculate the Nusselt number and its relations with other dimensionless numbers are presented. In the experimental part the way in

which a prototype rode is assembled is presented; measurements of temperatures attained in steady state and in free convection for working fluids such as air and water are shown in tables. Also graphs of Nusselt numbers obtained in the experimental way through some empirical correlations are shown. DOE

N93-31336# Royal Aerospace Establishment, Farnborough (England).
HEAT TRANSFER MEASUREMENTS USING INFRA-RED THERMOGRAPHY IN RAREFIED FLOWS
M. F. Westby 2 Jul. 1992 21 p Presented at the NATO Advanced Research Workshop on New Trends in Instrumentation for Hypersonic Research, Le Faugua-Mauzac, France, 27 Apr. - 1 Mar. 1992
(RAE-TM-W-1; BR-312834; ETN-93-93787) Copyright Avail: CASI HC A03/MF A01

Tests carried out in a low density wind tunnel to determine the heat transfer rate on a flat plate and a series of sharp slender cones are described. The tests were carried out in the transitional rarefied flow regime. An IR scanning camera system was used to determine surface temperatures and hence heat transfer rate. Data were compared with two analytical theories and one existing set of data. Results show that the IR system is at least as good at determining heat transfer rates as a thermocouple technique and has better spatial resolution. The technique is also sensitive enough to detect changes in the state of the flow over the surface of models. ESA

N93-31429# European Space Agency, Paris (France).
CONTRIBUTION TO THE THEORETICAL STUDY AND FINITE-ELEMENT APPROXIMATION OF THE MULTIDIMENSIONAL, MULTISPECIES, HYPERBOLIC SYSTEM OF GAS DYNAMICS Ph.D. Thesis - Paris VI Univ., 1990
Jean-Pierre Croisille (Office National d'Etudes et de Recherches Aerospatiales, Paris, France.) Jan. 1993 209 p Transl. into ENGLISH of Contribution a l'Etude Theorique et a l'Approximation par Elements Finis du Systeme Hyperbolique de la Dynamique des Gaz Multidimensionnelle et Multiespeces (Paris, France, ONERA) 1991 p 1-190 Original language document was announced as N92-19903
(ESA-TT-1275; ONERA-NT-1991-3; ETN-93-93916) Avail: CASI HC A10/MF A03

A number of points relating to the change of variables in thermodynamics (extensive, intensive variables) and in gas dynamics (conservative, entropic variables) are clarified. The system of compressible Euler equations for gas mixtures is described from the thermodynamic viewpoint without regard to any particular equation of state for the pressure. The concept of a K-diagonalizable system conveys in a single formalism the at once symmetric and kinetic aspects of the Euler equation system and permits generalization of the splitting of the Jacobian for the equations through the sign of the eigenvalues in a kinetic type splitting. A discontinuous Galerkin type finite element method of approximation involving entropic variables and a kinetic type splitting is proposed. Some of its properties are elucidated. The case of Friedrichs system is also considered. A method of mesh refinement is then implemented in two dimensions. ESA

N93-31438# Chicago Univ., IL. Dept. of Mechanical Engineering.
STUDY OF PIPE FRICTION REDUCTION MATERIALS FOR GAS TRANSPORTATION. Final Report, Jan. - Dec. 1992
Soyoung S. Cha Feb. 1993 31 p Sponsored by Gas Research Inst.
(Contract GRI-5090-260-2145)
(PB93-189181; OML-9301; GRI-93/0052) Avail: CASI HC A03/MF A01

Microgrooves inscribed in pipe surfaces may substantially reduce flow resistance. This one-year effort was mostly spent building a water test loop for riblet-pipe testing. During the initial system check, very limited data with uncertainty were collected. Based on these data, riblet pipes appear to achieve a maximum friction reduction of 30% to cover a smooth pipe. The relative riblet height (height/diameter) and Reynolds number are important dimensionless parameters, influencing pipe performance. This finding may contradict the previous understanding that emphasized only the effects of wall units. When the effect of relative riblet height is considered, heights for typical large gas transmission and distribution lines may not vary significantly and may be in the range near a hundredth of an inch. These trends may be beneficial to and provide hopes for practical applications if inexpensive microgroove inscription directly onto the wall is possible. NTIS

N93-31477# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CONTRIBUTION TO THE EXPERIMENTAL AND THEORETICAL STUDY OF VORTEX BREAKDOWN Ph.D. Thesis - Paris VI Univ., 1 Dec. 1989 [CONTRIBUTION A L'ETUDE EXPERIMENTALE ET THEORIQUE DE L'ECLATEMENT TOURBILLONNAIRE EN AIR INCOMPRESSIBLE]
Didier Pagan Nov. 1990 142 p In FRENCH
(ONERA-NT-1990-12; ETN-93-93730) Avail: CASI HC A07/MF A02

A wind tunnel experimental study of incipient breakdown conditions and a detailed description of some configurations are reported. Two experimental set ups were used to vary the shape of the upstream velocity distributions. Breakdown is induced by an adjustable adverse pressure gradient. A breakdown limiting curve (rotation rate versus compression rate) was determined for various upstream velocity distribution shapes. Accurately described configurations can be used as experimental references for computation code validation. On the theoretical level, a numerical model based on Navier-Stokes equations for a laminar, incompressible, axisymmetric flow was developed. Stationary solutions of the bubble type were obtained. A systematic utilization of this code allowed the breakdown limit to be computed as a relation between the different parameters of influence. This breakdown limiting curve is in good agreement with the experimental one. ESA

N93-31484# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
TERMINATION CRITERIA FOR GMRES-LIKE METHODS TO SOLVE THE DISCRETIZED INCOMPRESSIBLE NAVIER-STOKES EQUATIONS
C. Vuik 1992 32 p
(Rept-92-50; ETN-93-94242) Copyright Avail: CASI HC A03/MF A01

Some strategies to solve the discretized incompressible Navier-Stokes equations in general coordinates are discussed. For the implicit time integration a termination criterion is given, and some practical and theoretical properties of this criterion are shown. The linear systems, momentum, pressure, and transport equations are solved each timestep by an iterative solution method (GMRES). Several starting and stopping strategies are specified and discussed. Some numerical experiments are used to illustrate the theory. These experiments show that a clever solution strategy can save much CPU (Central Processing Unit) time. ESA

N93-31494# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
FLUID FLOW VISUALIZATION
Frits H. Post and Theo vanWalsum 1992 41 p Original contains color illustrations
(Rept-92-69; ETN-93-94261) Copyright Avail: CASI HC A03/MF A01

An overview of techniques for visualization of fluid flow data is presented. An introduction to experimental flow visualization is given and computer graphics flow visualization is addressed. A pipeline model of the flow visualization process is used as a basis for presentation. Conceptually, this process centers around visualization mapping, or the translation of physical flow parameters to visual representations. Starting from a set of standard mappings partly based on equivalents from experimental visualization, a number of data preparation techniques are described to prepare the flow data for visualization. A number of perceptual effects and rendering techniques are described, and some problems in visual presentation are discussed. ESA

N93-31496# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
BENCHMARK SOLUTIONS FOR THE INCOMPRESSIBLE NAVIER-STOKES EQUATIONS IN GENERAL COORDINATES ON STAGGERED GRIDS
C. W. Oosterlee, P. Wesseling, A. Segal, and E. Brakkee 1992 28 p
(Rept-92-67; ETN-93-94259) Copyright Avail: CASI HC A03/MF A01

Benchmark problems are solved with the stationary incompressible Navier-Stokes equations discretized with a finite volume method in general curvilinear coordinates on a staggered grid. The problems solved are skewed driven cavity problems, recently proposed as nonorthogonal grid benchmark problems. The system of discretized equations is solved efficiently with a nonlinear multigrid algorithm, in which a robust line smoother is implemented. Another benchmark problem in which a 90 degree change in grid line direction occurs is introduced and solved. ESA

N93-31519# Technische Univ., Eindhoven (Netherlands).
ON THE VERIFICATION OF A THEORY FOR SCULLING PROPULSION Ph.D. Thesis
Rudolf Mathias Roisa Muijtjens 1992 113 p
(Contract STW-GWI27.0277)
(ETN-93-94040) Avail: CASI HC A06/MF A02

The experimental verification of an optimization theory for sculling propulsion is described. The optimization theory models the hydrodynamics of a specific class of sculling propellers. The propeller consists of one wing or two wings moving side by side or one behind the other. An optimum motion to generate a certain prescribed mean thrust with the highest possible hydrodynamic efficiency can be calculated with this model. The optimum motion consists of a periodic sideways motion of the wing superimposed by a periodic pitching motion. The forces and the moment as a function of time for the two dimensional wing(s) can be calculated as well. The theoretical model reached a stage where a comparison with measurements was necessary. The verification of the theory is divided into three parts, namely: an introduction to the theory of sculling propulsion; an evaluation of the methods and assumptions used; a comparison of theoretical and measured results. A prototype designed for measurements was tested in towing tank, showing that the theory yields equivalent results for the mean thrust in several cases tested. ESA

N93-31527# Universiteit Twente, Enschede (Netherlands). Faculty of Applied Mathematics.
ROE'S SCHEME AND THE MUSCL TECHNIQUE FOR THE NAVIER-STOKES EQUATIONS
J. W. vanderBurg, J. G. M. Kuerten, and P. J. Zandbergern Oct. 1992 26 p Sponsored by National Aerospace Lab., Netherlands
(MEMO-1090; ETN-93-94130) Avail: CASI HC A03/MF A01

Roe's scheme is a first order accurate upwind scheme for solving discrete conservation laws. The MUSCL technique originally developed by van Leer is a suitable technique for obtaining a higher order accurate TVD scheme. The MUSCL approach based on variable interpolation is applied to Roe's scheme. It is shown that the resulting scheme is a suitable scheme for simulating two dimensional turbulent flow. A comparison with a scheme using central differences and artificial dissipation which shows that the low amount of numerical dissipation in the MUSCL scheme gives a better representation of the physics than the central scheme. ESA

N93-31547# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
NUMERICAL STUDY OF A MULTIGRID METHOD WITH FOUR SMOOTHING METHODS FOR THE INCOMPRESSIBLE NAVIER-STOKES EQUATIONS IN GENERAL COORDINATES
S. Zeng and P. Wesseling 1993 28 p
(Rept-93-04; ETN-93-94299) Copyright Avail: CASI HC A03/MF A01

The performance of a linear multigrid method using four smoothing methods, called SCGS (Symmetrical Coupled Gauss Seidel), CLGS (Collective Line GS), SILU (Scalar ILU), and CILU (Collective ILU) is investigated for the incompressible Navier-Stokes equations in general coordinates, in association with Galerkin coarse grid approximation. Robustness and efficiency are measured and compared by application to test problems. The numerical results show that CILU is the most robust, SILU the least, with CLGS and SCGS in between. CLGS is the best in efficiency, SCGS and CILU follow, and SILU is the worst. ESA

N93-31634# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
AN ILU SMOOTHER FOR THE INCOMPRESSIBLE NAVIER-STOKES EQUATIONS IN GENERAL COORDINATES
S. Zeng and P. Wesseling 1992 26 p
(Rept-92-91; ETN-93-94280) Copyright Avail: CASI HC A03/MF A01

ILU smoothers are good smoothers for linear multigrid methods. A smoother for the incompressible Navier-Stokes equations, called CILU (Collective ILU), is designed, based on r-transformations. Existing ILU decompositions factorize the matrix with real elements. In CILU the elements of the matrix that is factorized are submatrices, corresponding to the set of physical variables. A multigrid algorithm using CILU as smoother is investigated. Average reduction factors and limiting reduction factors are measured to explore the performance of the algorithm. The results show that CILU is a good smoother. ESA

N93-31641*# California Polytechnic State Univ., San Luis Obispo. Dept. of Mechanical Engineering.
COMPARISON OF STRAIGHT AND 15 DEGREE VECTORED NOZZLES USING A SIX COMPONENT THRUST STAND Final Technical Report, Oct. 1990 - Dec. 1991
Thomas W. Carpenter and Scott Flake 1991 366 p
(Grant NAG2-559)
(NASA-CR-193291; NAS 1.26:193291) Avail: CASI HC A16/MF A03

This project compared the forces and moments produced by straight and 15 degree vectored nozzles. Using the six component thrust stand in the engines laboratory at California Polytechnic State University, several trials were performed. This data was then reduced using first a computer program and then later an electronic spreadsheet. This reduced data was graphed and compared. As a result of these comparisons some unexpected forces were discovered. Several more tests were run including a zero thrust test and a statistical comparison were done to discover the source of these discrepancies. As a direct result several nozzle changes were made and significant revisions to the thrust stand are being made.
Author (revised)

N93-31647*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
MEASUREMENTS AND COMPUTATIONAL ANALYSIS OF HEAT TRANSFER AND FLOW IN A SIMULATED TURBINE BLADE INTERNAL COOLING PASSAGE
Louis M. Russell, Douglas R. Thurman (Army Research Lab., Cleveland, OH.), Patricia S. Simonyi (Sverdrup Technology, Inc., Brook Park, OH.), Steven A. Hippensteele, and Philip E. Poinsatte Jun. 1993 24 p Presented at the 29th Joint Propulsion Conference and Exhibit, Monterey, CA, 28-30 Jun. 1993; sponsored by AIAA, SAE, ASME, and ASEE Original contains color illustrations
(RTOP 505-62-52)
(NASA-TM-106189; E-7894; NAS 1.15:106189; AIAA Paper 93-1797; ARL-MR-91) Avail: CASI HC A03/MF A01; 5 functional color pages

Visual and quantitative information was obtained on heat transfer and flow in a branched-duct test section that had several significant features of an internal cooling passage of a turbine blade. The objective of this study was to generate a set of experimental data that could be used to validate computer codes for internal cooling systems. Surface heat transfer coefficients and entrance flow conditions were measured at entrance Reynolds numbers of 45,000, 335,000, and 726,000. The heat transfer data were obtained using an Inconel heater sheet attached to the surface and coated with liquid crystals. Visual and quantitative flow field results using particle image velocimetry were also obtained for a plane at mid channel height for a Reynolds number of 45,000. The flow was seeded with polystyrene particles and illuminated by a laser light sheet. Computational results were determined for the same configurations and at matching Reynolds numbers; these surface heat transfer coefficients and flow velocities were computed with a commercially available code. The experimental and computational results were compared. Although some general trends did agree, there were inconsistencies in the temperature patterns as well as in the numerical results. These inconsistencies strongly suggest the need for further computational studies on complicated geometries such as the one studied. Author

N93-31657# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
MULTIGRID SCHEMES FOR TIME-DEPENDENT INCOMPRESSIBLE NAVIER-STOKES EQUATIONS
C. W. Oosterlee and P. Wesseling 1992 24 p
(Rept-92-102; ETN-93-94291) Copyright Avail: CASI HC A03/MF A01

The unstationary incompressible Navier-Stokes equations are discretized with a finite volume method in curvilinear coordinates on a staggered grid. Several multigrid schemes to solve time dependent equations are presented, investigated and compared: the time marching scheme, a parabolic multigrid scheme, and a multigrid waveform relaxation scheme. All methods are based on the same robust smoother, a coupled smoothing method. The behavior of the BDF(2) time discretization scheme is also investigated. Some test problems, not only rectangular ones, are investigated. ESA

N93-31658# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

GALERKIN COARSE GRID APPROXIMATION IN MULTIGRID FOR THE INCOMPRESSIBLE NAVIER-STOKES EQUATIONS

S. Zeng and P. Wesseling 1992 28 p

(Rept-92-103; ETN-93-94292) Copyright Avail: CASI HC A03/MF A01

Galerkin coarse grid approximation (GCA) in association with multigrid methods is investigated for the incompressible Navier-Stokes equations in general coordinates. An efficient algorithm performing GCA is presented. The behavior of coarse grid matrices is studied under GCA with different transfer operators. For the square driven cavity problem on a uniform Cartesian grid, the performance of the multigrid method using different combinations of transfer operators for the computation of coarse grid matrices and of coarse grid correction is investigated. Computations are also carried out in general coordinates for the L-shaped driven cavity problem. Good results are obtained. ESA

N93-31838 Institute of Sound and Vibration Research, Southampton (England). Fluid Dynamics and Acoustics Group.

PRACTICAL FLOW DUCT ACOUSTIC MODELLING

P. O. A. L. Davies Dec. 1992 33 p

(ISVR-TR-213) Copyright Avail: Issuing Activity (Institite of Sound and Vibration Research, University of Southampton, Southampton SO9 5NH, England)

This contribution is concerned with the development and description of appropriate physically realistic predictive models of acoustic propagation through flow duct systems. These are of practical relevance in design studies for active or passive noise control in industrial and transportation systems on the one hand, or to acoustic filter modeling on the other, concerning for example, articulatory synthesizers. It is demonstrated that such models have many common characteristics independent of their scale, but may require special features appropriate for a particular application. Author (revised)

N93-31860*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

HYPERSONIC ENGINE COMPONENT EXPERIMENTS IN HIGH HEAT FLUX, SUPERSONIC FLOW ENVIRONMENT

Herbert J. Gladden and Matthew E. Melis Jul. 1993 21 p Presented at the International Symposium on Optical Applied Science and Engineering, San Diego, CA, 11-16 Jul. 1993; sponsored by SPOIE

(RTOP 505-62-52)

(NASA-TM-106273; E-8002; NAS 1.15:106273) Avail: CASI HC A03/MF A01

A major concern in advancing the state-of-the-art technologies for hypersonic vehicles is the development of an aeropropulsion system capable of withstanding the sustained high thermal loads expected during hypersonic flight. Even though progress has been made in the computational understanding of fluid dynamics and the physics/chemistry of high speed flight, there is also a need for experimental facilities capable of providing a high heat flux environment for testing component concepts and verifying/calibrating these analyses. A hydrogen/oxygen rocket engine heat source was developed at the NASA Lewis Research Center as one element in a series of facilities at national laboratories designed to fulfill this need. This 'Hot Gas Facility' is capable of providing heat fluxes up to 450 w/sq cm on flat surfaces and up to 5,000 w/sq cm at the leading edge stagnation point of a strut in a supersonic flow stream. Gas temperatures up to 3050 K can also be attained. Two recent experimental programs conducted in this facility are discussed. The objective of the first experiment is to evaluate the erosion and oxidation characteristics of a coating on a cowl leading edge (or strut leading edge) in a supersonic, high heat flux environment. Macrophotographic data from a coated leading edge model show progressive degradation over several thermal cycles at aerothermal conditions representative of high Mach number flight. The objective of the second experiment is to assess the capability of cooling a porous surface exposed to a high temperature, high velocity flow environment and to provide a heat transfer data base for a design procedure. Experimental results from transpiration cooled surfaces in a supersonic flow environment are presented. Author (revised)

N93-32014# Institute for Advanced Study, Princeton, NJ. Dept. of Mathematics.

LOCALIZATION AND TRANSPORT IN RANDOM MEDIA Final Report, 1 Oct. 1991 - 30 Sep. 1992

Thomas Spencer 19 Feb. 1993 6 p

(Contract F49620-92-J-0023)

(AD-A264640; AFOSR-93-0321TR) Avail: CASI HC A02/MF A01

During the 1991-1992 academic year the Institute for Advanced Study conducted a Program in applied mathematics with special emphasis on computational fluid dynamics. This was the first time since the days of von Neumann that the Institute has had a major presence in applied mathematics. The senior mathematicians who formed the core of this Program were A. Chorin, B. Engquist, A. Majda, G. Papanicolaou, and V. Rokhlin. There were a total of about fifteen members participating in the Program. AFOSR helped make this ambitious program possible by providing partial support for George Papanicolaou and Michael Shelly. They were both major participants in the Program and interacted intensively with their colleagues. DTIC

N93-32028# Army Research Lab., Aberdeen Proving Ground, MD.

NAVIER-STOKES COMPUTATIONS FOR KINETIC ENERGY PROJECTILES IN STEADY CONING MOTION: A PREDICTIVE CAPABILITY FOR PITCH DAMPING Final Report, Sep. 1989 - Jan. 1992

Paul Weinacht and Walter B. Sturek Apr. 1993 37 p

(AD-A264111; ARL-TR-112) Avail: CASI HC A03/MF A01

Previous theoretical investigations have proposed that the side force and moment acting on a body of revolution in steady coning motion could be related to the pitch damping force and moment. In the current research effort, this approach has been applied to produce the first known Navier-Stokes predictions of the pitch damping for finned projectiles. The flow field about pinned kinetic energy projectiles in steady coning motion has been successfully computed using a parabolized Navier-Stokes computational approach. The computations make use of a rotating coordinate frame in order to solve the steady flows equations. From the computed flow field, the side moment due to coning motion is used to determine the pitch-damping coefficient. The computational predictions of the slope of the side moment coefficient with coning rate normalized by the sine of the angle of attack have been compared with pitch damping coefficients determined from range firings for two finned projectile configurations. The predictions show good agreement with the range data. This computational approach provides a significant predictive capability for the design of kinetic energy projectiles whose terminal ballistic performance can be degraded by moderate levels of yaw at the target. DTIC

N93-32071# Pennsylvania State Univ., University Park. Applied Research Lab.

AN INCOMPRESSIBLE AXISYMMETRIC THROUGH-FLOW CALCULATION PROCEDURE FOR DESIGN AND OFF-DESIGN ANALYSIS OF TURBOMACHINERY

B. W. Siebert and A. M. Yocum May 1993 187 p

(Contract N00039-88-C-0051)

(AD-A264933; TR-93-05) Avail: CASI HC A09/MF A02

A computational procedure has been developed which solves the steady-state incompressible Navier-Stokes (or Reynolds) equations for axisymmetric flows through turbomachinery. The solution of the Navier-Stokes equations allows for the prediction of recirculating flow regions that may be due to either through-flow geometry or off-design operating conditions. The effects of the blade rows are represented in an approximate manner by replacing the forces they impart to the fluid in the axial, radial, and tangential directions with body forces. In order to provide an algorithm which can be applied to arbitrary turbomachinery geometries, the grid covering the flow domain is mapped into a computational plane in which the nodal spacing becomes unity. The Navier-Stokes equations are transformed so that they become a spatial function of the generalized curvilinear coordinates that describe the computational plane. Local flux conservation is ensured by expressing the system of equations in conservative form and discretizing them using a control volume approach. The Pressure Weighted Interpolation Method (PWIM), coupled with the SIMPLEC algorithm, is used to iteratively solve the discretized equations on a nonstaggered grid. DTIC

N93-32095# Old Dominion Univ., Norfolk, VA.
STRUCTURE AND STABILITY OF REACTING COMPRESSIBLE FREE SHEAR LAYERS Final Report, Jul. 1991 - Jun. 1993
C. E. Grosch Jun. 1993 14 p
(Grant AF-AFOSR-0250-91)
(AD-A265594; AFOSR-93-0405TR) Avail: CASI HC A03/MF A01

The contract is in support of research on the structure and stability of reacting compressible mixing layers. The research performed under this contract has resulted in our learning a great deal about the structure and stability of reacting compressible mixing layers. DTIC

N93-32175# Los Alamos National Lab., NM.
A CONTINUATION METHOD FOR COMPUTING NON-LINEAR 3-D FREE SURFACE FLOWS
N. A. Petersson Jan. 1993 3 p Presented at the 8th International Workshop on Water Waves and Floating Bodies, Newfoundland, Ontario, 23-26 May 1993
(Contract W-7405-eng-36)
(DE93-008704; LA-UR-93-507; CONF-9305140-1) Avail: CASI HC A01/MF A01

The subject of this paper is a pseudo-arclength continuation method for computing non-linear three-dimensional steady potential flow around a submerged body moving in an infinitely deep liquid at constant speed and distance below the free surface. DOE

N93-32198*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SPACE SHUTTLE ORBITER THERMAL PROTECTION SYSTEM DESIGN AND FLIGHT EXPERIENCE
Donald M. Curry Jul. 1993 20 p Presented at the First ESA/ESTEC Workshop on Thermal Protection Systems, Noordwijk, Netherlands, 5-7 May 1993 Sponsored by NASA. Washington
(NASA-TM-104773; S-725; NAS 1.15:104773) Avail: CASI HC A03/MF A01

The Space Shuttle Orbiter Thermal Protection System materials, design approaches associated with each material, and the operational performance experienced during fifty-five successful flights are described. The flights to date indicate that the thermal and structural design requirements were met and that the overall performance was outstanding. Author (revised)

N93-32199*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
A RAPID-DISTORTION-THEORY TURBULENCE MODEL FOR DEVELOPED UNSTEADY WALL-BOUNDED FLOW
G. J. Brereton (Michigan Univ., Ann Arbor.) and R. R. Mankbadi Jul. 1993 20 p
(Contract NCC3-233; RTOP 505-90-5K)
(NASA-TM-106249; ICOMP-93-22; E-7971; NAS 1.15:106249) Avail: CASI HC A03/MF A01

A new approach to turbulence modeling in unsteady developed flows has recently been introduced, based on results of rapid distortion theory. The approach involves closing the k-epsilon equations for the organized unsteady component of the flow by modeling local unsteadiness as a rapid distortion of the local structure of the parent turbulent flow, in terms of an effective strain parameter alpha(sub eff). In this paper, the phase-conditioned equations of motion are developed to accommodate a new unsteady dissipation model and local effects of the slow-relaxation time scale of the parent flow. The model equations are tested against measurements of the response of a fully-developed turbulent pipe flow to the superposition of sinusoidal streamwise oscillation. Good agreement is found between measurements and predictions over a wide range of frequencies of unsteadiness, indicating that this approach may be particularly well suited to modeling of unsteady turbulent flows which are perturbations about a well characterized mean. Author (revised)

N93-32303# Oak Ridge National Lab., TN. Metals and Ceramics Div.
UNDERSTANDING HEAT AND FLUID FLOW IN LINEAR GTA WELDS
T. Zacharia, S. A. David, and J. M. Vitek 1992 16 p Presented at the 3rd International Conference on Trends in Welding Research, Gatlinburg, TN, 1-5 Jun. 1992
(Contract DE-AC05-84OR-21400)
(DE93-012958; CONF-9206173-11) Avail: CASI HC A03/MF A01

A transient heat flow and fluid flow model was used to predict the development of gas tungsten arc (GTA) weld pools in 1.5 mm thick AISI 304 SS. The welding parameters were chosen so as to correspond to an earlier experimental study which produced high-resolution surface temperature maps. The motivation of the present study was to verify the predictive capability of the computational model. Comparison of the numerical predictions and experimental observations indicate good agreement. DOE

N93-32310# California Univ., San Diego, La Jolla. Office of Contract and Grant Administration.
ACTIVE CONTROL OF FLOW INDUCED RESONANCE IN CONTINUOUS CORRUGATED TUBES Final Technical Report, 1 Jul. - 30 Sep. 1992
Morteza Gharib 26 May 1993 18 p
(Contract N00014-92-J-1777)
(AD-A265782) Avail: CASI HC A03/MF A01

Wind tunnel experiments were conducted to study sound generation from corrugate tubes. Hot-wire and microphone measurements were used to determine the response of the following tube geometries to flow excitation: fully corrugated tube, tube with two corrugations, tube with one corrugation only, and tube with no corrugations at all. For the tube with at least two bumps, it was found that the acoustic output peaks when there is an integer number (K) of vortical structures in the cavities between two bumps. The highest peak corresponds to K=1. Some experiments were undertaken to suppress or at least minimize the sound level. One method which significantly reduced the sound intensity consisted of cutting a narrow strip off the tube along the whole length and replacing it with a smooth strip. This is equivalent to cutting a piece off each bump. A more active method of control consisted of forcing the first bump or cavity by using a set of twelve small speakers positioned in a circle around the tube. This technique only allowed the elimination of the lower sound levels, whereas the K=1 mode was only partially reduced. DTIC

N93-32329*# DCW Industries, La Canada, CA.
TURBULENCE AND TRANSITION MODELING FOR HIGH-SPEED FLOWS
David C. Wilcox Apr. 1993 40 p
(Contract DAAL03-89-C-0032; NASA Order L-54880-C; RTOP 505-59-50-01)
(NASA-CR-191473; NAS 1.26:191473; DCW-R-35-03) Avail: CASI HC A03/MF A01

Research conducted during the past three and a half years aimed at developing and testing a turbulence/transition model applicable to high-speed turbulent flows is summarized. The first two years of the project focused on fully turbulent flows, while emphasis shifted to boundary-layer development in the transition region during the final year and a half. A brief summary of research accomplished during the first three years is included and publications that describe research results in greater detail are cited. Research conducted during the final six months of the period of performance is summarized. The primary results of the last six months of the project are elimination of the k-omega model's sensitivity to the freestream value of omega and development of a method for triggering transition at a specified location, independent of the freestream turbulence level. Author (revised)

N93-32370*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
A p-VERSION FINITE ELEMENT METHOD FOR STEADY INCOMPRESSIBLE FLUID FLOW AND CONVECTIVE HEAT TRANSFER
Daniel L. Winterscheidt Jul. 1993 27 p
(Contract NCC3-233; RTOP 505-90-5K)
(NASA-TM-106260; ICOMP-93-23; E-7985; NAS 1.15:106260) Avail: CASI HC A03/MF A01

A new p-version finite element formulation for steady, incompressible fluid flow and convective heat transfer problems is presented. The steady-state residual equations are obtained by considering a limiting case of the least-squares formulation for the transient problem. The method circumvents the Babuska-Brezzi condition, permitting the use of equal-order interpolation for velocity and pressure, without requiring the use of arbitrary parameters. Numerical results are presented to demonstrate the accuracy and generality of the method. Author

N93-32371*# State Univ. of New York, Buffalo. Dept. of Mechanical and Aerospace Engineering.
TIME ACCURATE SIMULATIONS OF COMPRESSIBLE SHEAR FLOWS Final Report
Peyman Givi, Craig J. Steinberger, Thomas J. Vidoni, and Cyrus K. Madnia Jul. 1993 21 p
(Grant NAG3-1011)
(NASA-CR-193410; NAS 1.26:193410) Avail: CASI HC A03/MF A01

The objectives of this research are to employ direct numerical simulation (DNS) to study the phenomenon of mixing (or lack thereof) in compressible free shear flows and to suggest new means of enhancing mixing in such flows. The shear flow configurations under investigation are those of parallel mixing layers and planar jets under both non-reacting and reacting nonpremixed conditions. During the three-years of this research program, several important issues regarding mixing and chemical reactions in compressible shear flows were investigated. Author (revised)

N93-32397# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
SOME HISTORICAL NOTES ABOUT THE STEFAN PROBLEM
C. Vuik 1993 16 p
(Rept-93-07; ETN-93-94302) Copyright Avail: CASI HC A03/MF A01

Problems containing a free or moving boundary are called Stefan problems. The original Stefan problem treats the formation of ice in the polar seas. Some new little known information about the history of this problem is given. Stefan compares his mathematical results with measurements. It is shown that these measurements were done during polar expeditions to find a North-West Passage. A short description is given about the life and work of Stefan. Stefan's research on ice formation is summarized. Some comparisons with measurements are given. The new insights are described. ESA

N93-31588*# Pennsylvania State Univ., University Park.
PENN STATE AXIAL FLOW TURBINE FACILITY: PERFORMANCE AND NOZZLE FLOW FIELD
B. Lakshminarayana, M. Zaccaria, and S. Itoh (National Defence Academy, Yokosuka, Japan.) *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 283-292 (For primary document see N93-31552 12-20)
(Grant NAG3-555)
Avail: CASI HC A02/MF A03

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N93-31117# Nationaal Inst. voor Kernfysica en Hoge Energiefysica, Amsterdam (Netherlands). ZEUS Calorimeter Group.
THE ZEUS URANIUM CALORIMETER: MAIN CHARACTERISTICS AND FIRST OPERATING EXPERIENCE
R. Yoshida 1992 26 p Presented at the 3rd International Conference on Calorimetry in High Energy Physics, Corpus Christi, TX, 29 Sep. - 2 Oct. 1992
(NIKHEF-H/92-15; DESY-92-159; ETN-93-94086) Avail: CASI HC A03/MF A01

The uranium scintillator calorimeter of the ZEUS experiment in the HERA (German acronym for hadron electron storage ring) in Hamburg, Germany, is described. It covers 99.8% of the solid angle, has an energy resolution 35%/square root of E for single hadrons and jets, and 17.5%/square root of E for electrons. e/h is 1 within 2% in the energy range of 2 to 100 GeV. Test beams results show that an intercalibration at the 1% level is achievable using uranium radioactivity. The calorimeter was commissioned in Apr. 1992. The main characteristics of the calorimeter construction, readout, and trigger are reviewed. The experience from the first data taking period, including results on noise, stability of calibration, background from HERA accelerator, and performance of the calorimeter trigger is discussed. ESA

N93-31119# Tuebingen Univ. (Germany). Astronomisches Inst.
TEST MEASUREMENTS FOR QUICK ANALOG DIGITAL CONVERTERS FOR AN X RAY CCD CAMERA Thesis [TESTMESSUNGEN AN SCHNELLEN ANALOG-DIGITAL-WANDLERN FUER EINE ROENTGEN-CCD-KAMERA]
Frank Krull Jul. 1991 95 p In GERMAN Original contains color illustrations
(ETN-93-94204) Avail: CASI HC A05/MF A01

Three analog to digital converters are tested in order to choose the converter for x-ray imager coupled with European photon imaging camera in the framework of the high throughput X-ray Multi Mirror Mission. Three 12 bit half-parallel converters were examined by means of a test facility coupled with a workstation for data transfer with a general purpose input-output interface. Static examinations were performed in order to obtain transfer characteristics curve, amplification errors, zero point displacement, and integral nonlinearity. Dynamic examinations were carried out for determination of transient behavior and time. Histograms were achieved, to ascertain differential nonlinearity, statistical oscillations, systematic errors, and variations effects of functioning parameters such as supply voltages and temperature. All measurements were compared with manufacturer data. ESA

N93-31125# Oxford Univ. (England). Robotics Research Group.
EVALUATION OF A SOLID-STATE GYROSCOPE FOR ROBOTICS APPLICATIONS
Billur Barshan and Hugh F. Durrant-Whyte Oct. 1992 21 p
(Grant SERC-ACME-GR/6-38375)
(OUEL-1957/92; ETN-93-94229) Avail: CASI HC A03/MF A01

The evaluation of an avionics gyro, an inertial sensor originally intended for the guided munition market and proved to be suitable for the vehicle control market, is described. The adequacy of the system for various robotic tasks is assessed. The system comprises a solid state angular rate transducer gyroscope, a triaxial linear accelerometer and two inclinometers. An error model for the sensor is generated and included in a Kalman filter for processing the data. System performance with the error model is compared to the performance when no error model is incorporated in the system. The results demonstrate that without error compensation, the error in localization is between 5 to 15 degrees/min, but can by improved by a factor of 5 to 7 if an adequate error model is supplied. With the resulting accuracy, this solid state gyro is useful as a sensor for robotics applications. ESA

N93-31127# Laboratoire d'Automatique et d'Analyse des Systemes, Toulouse (France). Groupe Micro-Structures et Micro-Systeme Integres.
FEASIBILITY OF PIEZORESISTIVE PRESSURE SENSORS WITH POLYCRYSTALLINE SILICON GAUGES Ph.D. Thesis - Toulouse Univ. [ETUDE DE FAISIBILITE DE CAPTEURS DE PRESSION PIEZORESISTIFS A JAUGE EN SILICIUM POLYCRYSTALLIN]
Christophe Plantier 1992 194 p In FRENCH
(LAAS-92324; ETN-93-94234) Avail: CASI HC A09/MF A03

Piezoresistive pressure sensors, composed of thin single crystal silicon diaphragm and four polysilicon gauges, forming a Wheatstone bridge are investigated. The deflection of the body is modeled by means of Lagrange's partial derivative equation. An approximated solution of the polynomial type is proposed for square or rectangular diaphgrams, fully clamped at their edge. The stress and strain sensors are calculated for any point of the test body. Computational models for the elastic constants and the piezoresistive effect in the polysilicon are developed. The complete expression of the gauge's response is established. To validate the different theoretical models, demonstrators are developed. The experimental study of the behavior allows determination of the pressure response, linearity and sensitivity to temperature. With respect to piezoresistances, the maximal values of the longitudinal and transverse gauge factors are equal to 19 to 3 respectively. As far as the sensors are considered, linearity errors never exceed one thousandth for responses less than or equal to 0.7 percent of the bridge voltage. The minimal value of the thermal drift of the offset voltage is in the order of one millionth of the bias voltage per centrigrade degree. The polysilicon gauge sensors turn out to be fully reliable. They should be able to replace the sensors derived from more conventional technologies, notably in the field of high temperatures. ESA

N93-31191# Spire Corp., Bedford, MA.
MULTI-QUANTUM WELL LATERAL-FIELD-EFFECT ELECTRO-REFRACTION MODULATOR Final Report, 10 Aug. 1992 - 30 Mar. 1993
H. P. Maruska 7 May 1993 36 p
(Contract N00014-92-C-0150)
(AD-A264411; Spire-FR-60256) Avail: CASI HC A03/MF A01

We have successfully designed, fabricated, and tested a new electro-optic modulator based on the Lateral Electric Field Induced Refraction (LEFIR) effect. The entire combination of GaAs and Al(x)Ga(l-x)As layers, including multiple quantum wells and delta-doped planes, were deposited by metalorganic chemical vapor deposition in a single growth run. The modulator was fashioned as a tunable Fabry-Perot Interferometer, with upper and lower stacks of Bragg mirrors enclosing the active spacer region, which contains the quantum wells. It was shown that the basic operating principle for the LEFIR modulator relies on shifting electric charges, which originated in the delta-doped plane, into and out of the series of quantum wells, i.e., the Band Filling Electro-Optic Effect. After successful deposition of individual mirrors, delta-doped planes, and quantum well structures, a complete LEFIR modulator was produced, which exhibited a sharp Fabry-Perot transmission mode at 969 nm. Calculations indicated that the transmission of the device can be shifted from 75% to 5% by the application of about 15 volts bias with the initial structure. In Phase 2, we shall seek to optimize the structure, and to progress to two-dimensional arrays of modulators. DTIC

N93-31214# National Inst. of Standards and Technology, Gaithersburg, MD. Process Measurements Div.
TEMPERATURE-ELECTROMOTIVE FORCE REFERENCE FUNCTIONS AND TABLES FOR THE LETTER-DESIGNATED THERMOCOUPLE TYPES BASED ON THE ITS-90
G. W. Burns, M. G. Scroger, G. F. Strouse, M. C. Croarkin, and W. F. Guthrie Apr. 1993 636 p See also PB91-112854
(PB93-190338; NIST/Mono-175) Avail: CASI HC A99/MF A06

The International Temperature Scale of 1990 (ITS-90) and the new representation of the volt came into effect on 1 January 1990. Those changes required that the then-existing IPTS-68 based temperature-electromotive force reference functions and tables for thermocouples be revised to give values in terms of the ITS-90 and the SI volt. This monograph gives the new reference functions and tables for the eight letter-designated thermocouple types: noble-metal types B, R, and S; and base-metal types E, J, K, N, and T. Also, for these thermocouple types, reference functions and tables of their thermoelements versus the NIST platinum thermoelectric reference standard, Pt-67, are given. The computational methods used to derive each of the new reference functions are described. NTIS

N93-31247# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
SQUIDs IN THERMAL DETECTORS OF WEAKLY INTERACTING PARTICLES
V. N. Trofimov 1991 16 p
(DE93-609531; JINR-E-8-91-67) Avail: CASI HC A03/MF A01 (US Sales Only)

The application of four different types of SQUID-assisted thermometers for cryogenic thermal detectors of weakly interacting particles is analyzed with two of them for the first time. The classic resistive thermometer is considered as well for the comparison. Original results of testing the detector with working temperature of 1K and thermocouple thermometer with SQUID are given. The conclusion is made that temperature resolution of 10(exp -10) kHz(sup -1/2) or energy sensitivity of 1-10 eV per 1 kg of detector mass can be achieved when using the SQUID-assisted thermometers. DOE

N93-31297*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
TWO-STAGE GAS MEASUREMENT SYSTEM Patent Application
Danny R. Sprinkle, inventor (to NASA), Tony T. D. Chen, inventor (to NASA) (Old Dominion Univ., Norfolk, VA.), and Sushil K. Chaturvedi, inventor (to NASA) (Old Dominion Univ., Virginia Beach, VA.) 7 May 1992 10 p
(NASA-Case-LAR-14791-1; NAS 1.71:LAR-14791-1;
US-Patent-Appl-SN-879480) Avail: CASI HC A02/MF A01

A quick-response, real-time gaseous measurement system allows for the continuous sampling of a low pressure gaseous environment. A sample of test gas from the low pressure gaseous environment is continuously extracted and pumped to a structural tee joint which is open to the atmosphere at one end to maintain the test gas at a constant pressure. The structural tee joint communicates at the other end with a heater for maintaining the test gas at a constant temperature. From the heater, the test gas is sent to a sensor which develops a voltage that is proportional to the partial pressure of the gaseous component to be measured in the test gas, a constant flow rate of test gas being provided through the heater and sensor. Since test gas pressure, temperature, and flow rate are being held constant, changes in sensor voltage are attributable only to changes in the concentration of the measured gas component. NASA

N93-31298*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
HIGH TEMPERATURE, OXIDATION RESISTANT NOBLE METAL-Al ALLOY THERMOCOUPLE Patent Application
James L. Smialek, inventor (to NASA) and Michael Gedwill, inventor (to NASA) 6 Jul. 1993 22 p
(NASA-Case-LEW-15515-1; NAS 1.71:LEW-15515-1;
US-Patent-Appl-SN-086584) Avail: CASI HC A03/MF A01

A thermocouple having an electropositive leg formed of a noble metal-Al alloy and an electronegative leg electrically joined at respective ends thereof to form a thermocouple junction. The thermocouple provides for accurate and reproducible measurement of high temperatures (600 - 1300 C) in inert, oxidizing, or reducing environments, gases, or vacuum. Furthermore, the thermocouple circumvents the need for expensive, strategic precious metals such as rhodium as a constituent component. Selective oxidation of rhodium is also thereby precluded. NASA

N93-31325 National Physical Lab., Teddington (England). Quantum Metrology Div.
THE NPL REFERENCE HAZEMETER
G. H. C. Freeman Sep. 1992 26 p
(NPL-QU-94; ETN-93-93746) Copyright Avail: Issuing Activity (National Physical Lab., Teddington, Middlesex, TW11 0LW, England)

The reference hazemeter is a development of a commercial pivotable sphere hazemeter. The principle improvements are a high quality photometer and its associated electronic and temperature controller, a stable power supply for the source and the determination of the lamp current of illuminants A and C, improvements to the optics to achieve a well shaped beam, and mechanical modifications to accommodate the improvements and allow a good mechanical movement. Various tests were carried out to validate the instrument behavior. These identified systematic errors caused by inter-reflections. To reduce the inter-reflection errors, the blue filter and the input lenses were antireflection coated. The reference hazemeter complies with BS 2782--methods of testing plastics; part 5--optical and color properties; method 521A--determination of haze of film and sheet. A calibration service using the hazemeter is now in operation. ESA

N93-31835# Korean Atomic Energy Research Inst., Daeduk (Republic of Korea).
PULSE HOLOGRAPHIC MEASUREMENT TECHNIQUES
Cheol Jung Kim, Seong Hoon Baik, Seok Kyung Hong, Jeong Moog Kim, and Duk Hyun Kim Jan. 1992 155 p In KOREAN
(DE93-607634; KAERI/AR-334/91) Avail: CASI HC A08/MF A02 (US Sales Only)

With the development of lasers, remote inspection techniques using lasers have been used. The inspection and measurement techniques by pulse holography are well-established techniques for precise measurement, and widely used in various fields of industry now. In nuclear industry, this technology is practically used because holographic inspection is a remote, noncontact, and precise measurement technique. In relation to remote inspection technology in nuclear industry, state-of-the-art of pulse HNDT (Holographic non-destructive testing) and holographic measurement techniques are examined. First of all, the fundamental principles as well as practical problems for applications are briefly described. The fields of pulse holography were divided into the HNDT, flow visualization and distribution study, and other application techniques. Additionally holographic particle study, bubble chamber holography, and applications to other visualization

techniques are described. Lastly, the current status for the researches and applications of pulse holography to nuclear industry which are carried out actively in Europe and in the U.S.A., is described. DOE

N93-32208 Department of the Navy, Washington, DC.
SEALED ACOUSTICAL ELEMENT USING CONDUCTIVE EPOXY Patent
Patrick J. Monahan, inventor (to Navy) 30 Mar. 1993 5 p Filed 28 May 1992
(AD-D015736; US-Patent-5,199,004; US-Patent-Appl-SN-892056; US-Patent-Class-367-157) Avail: US Patent and Trademark Office

A radially-polarized piezoelectric cylindrical transducer is provided. The transducer has an electrically conductive end cap affixed with a conductive epoxy to one end of a piezoelectric body and a second cap affixed to the other end. The piezoelectric body comprises a layer of piezoelectric material located between an inner and an outer electrode. The outer electrode has an electrode gap which electrically insulates the end cap from the outer electrode. The unit is electrically conductive and permits the attachment of two electrical leads to its exterior, one to the first end cap and the other to the outer electrode of the piezoelectric body. DTIC

N93-32306# Sandia National Labs., Albuquerque, NM.
MICROMACHINED CHEMICAL SENSOR WITH INTEGRATED MICROELECTRONICS
J. Smith, J. Sniegowski, D. Koehler, T. Ricco, S. Martin, and P. McWhorter 1992 4 p Presented at the Expo 1993, Oak Ridge, TN, May 1993 (Contract DE-AC04-76DP-00789)
(DE93-013761; SAND-92-2623C; CONF-9305110-1) Avail: CASI HC A01/MF A01

With today's continued emphasis on environmental safety and health issues, a resurgence of interest has developed in the area of chemical sensors. These sensors would typically be used to monitor contamination hazards such as underground storage tanks or to assess previous contamination at waste disposal sites. Human exposure to chemical hazards can also be monitored. Additionally, these sensors can be used as part of a manufacturing process control loop. One type of sensor suitable for gas phase monitoring of chemicals is the quartz resonator or quartz crystal microbalance (QCM) sensor. In this type of sensor, a thickness shear mode (TSM) quartz resonator is coated with a film that interacts with the chemical species of interest. Changes in the mass and elasticity of this film are reflected as changes in the resonant properties of the device. Therefore, the presence of the species of interest can be detected by monitoring the frequency of an oscillator based on the resonance of the quartz. These QCM sensors compete with surface acoustic wave (SAW) devices as a means for monitoring gas phase species. SAW devices are typically more sensitive to small amounts of a species, but the instrumentation associated with a SAW device is an order of magnitude more expensive than the instrumentation associated with a TSM wave resonator since the SAW devices operate in the 100's of MHz frequency regime while quartz resonators operate in the 5-25 MHz regime. We are working to improve the sensitivity of the QCM sensor by increasing the frequency of the device to 25 MHz (compared to the typical 5 MHz crystal) and by increasing the frequency stability of the system to an ultimate goal of 0.1 Hz. The 25 MHz QCM has already been achieved, and once the stability goal is achieved, the QCM will have the same sensitivity as a SAW device. DOE

N93-32366*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
EVALUATION OF CHEMICAL CONVERSION MATERIAL (PROTECTIVE COATING) EXPOSED TO SPACE ENVIRONMENTAL CONDITIONS Final Report
D. L. Edwards Jul. 1993 22 p
(NASA-TM-108416; NAS 1.15:108416; CDDF-90-07) Avail: CASI HC A03/MF A01

This report focuses on the development of an operational Rutherford backscattering spectrometry (RBS) system and shows the application of such a system on a space environmental test. Thin films of aluminum and tantalum were deposited on diamond substrates. These films were anodized and preexposure characterization spectra obtained using RBS and total hemispherical reflectance. The samples were exposed to energetic protons then postexposure characterization spectra was obtained using the same techniques. Conclusions based on the comparison of preexposure and postexposure spectra are presented. RBS comparison spectra show no change in the metal/metal oxide interface, while the comparison reflectance data indicate change. Explanations for this reflectance change are presented in this report. Author

N93-31553*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
PROGRESS IN THE MEASUREMENT OF SSME TURBINE HEAT FLUX WITH PLUG-TYPE SENSORS
Curt H. Liebert *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 3-7 (For primary document see N93-31552 12-20)
Avail: CASI HC A01/MF A03

N93-31554*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THIN FILM HEAT FLUX SENSOR FOR SPACE SHUTTLE MAIN ENGINE TURBINE ENVIRONMENT
Herbert Will *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 9-13 (For primary document see N93-31552 12-20)
Avail: CASI HC A01/MF A03

N93-31555*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THIN FILM THERMOCOUPLES FOR HIGH TEMPERATURE TURBINE APPLICATION
Lisa C. Martin *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 15-20 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

N93-31969*# Media Logic, Inc., Plainville, MA.
RECORDING AND WEAR CHARACTERISTICS OF 4 AND 8 MM HELICAL SCAN TAPES
Klaus J. Peter and Dennis E. Speliotis (Advanced Development Corp., Burlington, MA.) *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 431-447 (For primary document see N93-31964 12-82)
Avail: CASI HC A03/MF A03

N93-31970*# California Univ., Berkeley. Computer Science Dept.
STRIPED TAPE ARRAYS
Ann L. Drapeau *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 449-456 (For primary document see N93-31964 12-82)
Avail: CASI HC A02/MF A03

N93-31974*# Eastman Kodak Co., Rochester, NY. Electronic Imaging Storage Research Labs.
KODAK PHASE-CHANGE MEDIA FOR OPTICAL TAPE APPLICATIONS
Yuan-Sheng Tyan, Donald R. Preuss, George R. Olin, Fridrich Vazan, Kee-Chuan Pan, and Pranab. K. Raychaudhuri *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 499-511 (For primary document see N93-31964 12-82)
Avail: CASI HC A03/MF A03

N93-31975*# Optex, Inc., Rockville, MD.
ELECTRON TRAPPING OPTICAL DATA STORAGE SYSTEM AND APPLICATIONS
Daniel Brower, Allen Earman, and M. H. Chaffin *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 513-520 (For primary document see N93-31964 12-82)
Avail: CASI HC A02/MF A03

N93-32139*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Artificial Intelligence Group.
ATTENTION FOCUSSING AND ANOMALY DETECTION IN REAL-TIME SYSTEMS MONITORING
Richard J. Doyle, Steve A. Chien, Usama M. Fayyad, and Harry J. Porta *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop

on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 314-319 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

36 LASERS AND MASERS

Includes parametric amplifiers.
For related information see also *76 Solid-State Physics.*

N93-31095 Emory Univ., Atlanta, GA. Dept. of Chemistry.
LASER-ASSISTED CHEMICAL VAPOR DEPOSITION OF InN ON Si(100) Technical Report No. 17
Y. Bu and M. C. Lin 1993 26 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-89-J-1235)
(AD-A264266) Avail: CASI HC A03

Laser-assisted chemical vapor deposition of InN on Si(100) using HN3 and trimethyl indium (TMIn) with and without 308-nm photon excitation has been studied with XPS, UPS, and SEM. Without 308-nm excimer laser irradiation, no InN film was built on the surface under the present low-pressure conditions. When the photon beam was introduced, InN films with In:N atomic ratio of 1.0 +/- 0.1 and a thickness of more than 20 A (the limit of the electron escaping depth for the In(sub 3d) X-ray photoelectrons) were formed at temperatures of 300 to 700 K. The He2 UP spectra taken from these InN films agree well with the result of a pseudo-potential calculation for the InN valence band. Our XPS measurements indicate a 3-D island growth of InN on Si(100) at 700 K, which is confirmed by the SEM images. Although the SEM images taken from the same samples with 2,000x magnification showed very smooth InN films, InN islands of about 100 nm in diameter could be clearly observed with a magnification of greater than or equal to 20,000x. In contrast, the InN film grown at 300 K showed valleys of uncovered substrate instead of InN islands. These uncovered substrate areas, corresponding to about 5 percent of the surface exposed to the probing X-ray radiation, probably result from incomplete decomposition of In-C bonds and poor diffusion kinetics at this temperature. Above 800 K, dissociation and desorption of In- and N-containing species occurred and thus no InN film was formed on the surface. DTIC

N93-31131 Montana State Univ., Bozeman.
MODE HOPPING IN SEMICONDUCTOR LASERS Ph.D. Thesis
Timothy Alan Heumier 1992 78 p
Avail: Univ. Microfilms Order No. DA9312275

Semiconductor lasers have found widespread use in fiber optic communications, merchandizing (bar-code scanners), entertainment (videodisc and compact disc players), and in scientific inquiry (spectroscopy, laser cooling). Some uses require a minimum degree of stability of wavelength which is not met by these lasers: Under some conditions, semiconductor lasers can discontinuously switch wavelengths in a back-and-forth manner. This is called mode hopping. We show that mode hopping is directly correlated to noise in the total intensity, and that this noise is easily detected by a photodiode. We also show that there are combinations of laser case temperature and injection current which lead to mode hopping. Conversely, there are other combinations for which the laser is stable. These results are shown to have implications for controlling mode hopping. Dissert. Abstr.

N93-31133 Drexel Univ., Philadelphia, PA.
EFFECTS OF ATOMIC COHERENCE ON MULTI-LEVEL LASING SYSTEMS Ph.D. Thesis
Aaron Scott Manka 1992 133 p
Avail: Univ. Microfilms Order No. DA9311804

We begin with a discussion of the semiclassical effects of atomic coherence on driven atoms. We discuss the presence of a simultaneous population inversion in two pairs of a doubly driven three level atom and propose a new method for the indirect measurement of a weak decay rate by coupling it to a strong transition. We then describe a semiclassical laser with an active medium of driven atoms in the cascade configuration. In this configuration, the external driving field and the laser field share a common interaction level. We consider two possibilities of incoherent decay; one in which the decay takes place among the coherently coupled levels (a closed system) and the other in which the decay occurs only to a lower lying level removed from the coherent interactions (an open system). Both configurations present the interesting effect of a decrease in gain and steady state intensity as the strength of the external driving field is increased. We call this effect coherent quenching and show it is the result of quantum interferences. Finally, we conclude with a discussion of the quantum theory of driven cascade and lambda atoms. We derive the master equation and present results on the transient and steady state solutions of the density matrix and its moments such as average number of photons and variance. Among the results, is the appearance of a sub-Poissonian photon number distribution. We conclude with a discussion of the line width and fluctuation properties of this laser. Dissert. Abstr.

N93-31227# Melbourne Univ., Parkville (Australia). School of Physics.
MEASUREMENT OF THE SPATIAL COHERENCE OF A SOFT X RAY LASER
J. E. Trebes, S. Mrowka, R. A. London, T. W. Barbee, M. R. Carter, B. J. MacGowan, D. L. Matthews, L. B. DaSilva, G. F. Stone, and M. D. Feit et al 1991 11 p
(DE93-609404; UM-P-91/50) Avail: CASI HC A03/MF A01 (US Sales Only)

The spatial coherence of a neon-like selenium x-ray laser operating at 206 and 210 Angstroms was measured using a technique based on partially coherent x-ray diffraction. The time integrated spatial coherence of the selenium x-ray laser was determined to be equivalent to that of a quasi-monochromatic spatially incoherent disk source whose diameter is comparable to the line focus of the visible light laser pumping the x-ray laser. The spatial coherence was improved by narrowing the line focus width. DOE

N93-31340 Deutsche Geodaetische Kommission, Munich (Germany).
CONCEPTION OF A MODULAR REAL-TIME SYSTEM FOR LASER REMOTE SENSING WITH PARTICULAR CONSIDERATION OF UPWARD COMPATIBILITY Ph.D. Thesis - Tech. Univ. Munich [KONZEPTION EINES MODULAREN ECHTZEIT-SYSTEMS FUER DIE LASERENTFERNUNGSMESSUNG UNTER BESONDERER BERUECKSICHTIGUNG DER AUFWAERTSKOMPATIBILITAET]
Reiner Dassing Frankfurt, Germany Institut fuer Angewandte Geodaesie 1991 169 p In GERMAN Original contains color illustrations
(Ser-C-378; ETN-93-93535) Copyright Avail: Issuing Activity (Institut fuer Angewandte Geodaesie, Richard-Strauss-Allee 11, D-6000 Frankfurt am Main 70, Germany)

After analyzing the real time application of laser ranging instrumentation for geodetic examinations a structural model is presented. The components of this model act as parallel units which communicate with one another through the interchange of data. They summarize the measurement tasks and the tasks of the hardware components. This model is open for future oriented development goals to satisfy the challenges of upward compatibility of the system, modularity of exchanging the components of the measurement components and devices and the flexibility of changing the scope of the tasks of the system. Methods to avoid deadlock and to establish synchronization are presented. It is shown that a multiprocessor system must be used to cope with the numerous parallel tasks, according to timing requirements based on transputer technology. ESA

N93-31669# International Centre for Theoretical Physics, Trieste (Italy).
EXCITONIC BISTABILITIES, INSTABILITIES AND CHAOS IN LASER-PUMPED SEMICONDUCTOR
Nguyen Ba An, Nguyen Trung Dan, and Hoang Xuan Nguten Jul. 1992 15 p
(DE93-608677; IC-92/175) Avail: CASI HC A03/MF A01 (US Sales Only)

The Hurwitz criteria are used for a stability analysis of the steady state excitonic optical bistability curves in a semiconductor pumped by an external laser resonant with the exciton level. Besides the middle branch of the bistability curves which is unstable in the sense of the linear stability theory, other domains of instability in the upper and lower branches of the steady state curves were found. Numerical results show that a possible route to chaos in the photon-exciton system is period-doubling self-oscillation process. The influence of the presence of free carriers that coexist with the excitons is also discussed. DOE

N93-31826# Korean Atomic Energy Research Inst., Daeduk (Republic of Korea).
APPLICATIONS OF OPTICAL FIBER TO REMOTE LASER FLUORESCENCE ANALYSIS
Cheol Jung Kim, Jang Soo Shin, Sang Mock Lee, Jeong Moog Kim, Duk Heon Kim, and Seok Kyung Hong Dec. 1991 89 p In KOREAN
(DE93-607553; KAERI/AR-333/91) Avail: CASI HC A05/MF A01 (US Sales Only)

Fluorescence analysis using time-resolved laser fluorimetry was used for trace uranium analysis because this method shows high sensitivity and low detection limit and is less matrix dependent than any other fluorimetric measurement. By this time, the uranium analyses in the solution of reprocessing process or high radioactive area were primarily analyzed by sampling of the solution, but recently, a study on a remote uranium fluorescence analysis using optical fiber was setting out based on the development of an optical fiber with radiation resistivity and of an advanced laser excitation source. Laser fluorimetry developed by our laboratory for trace uranium analyses in uranium handling process or in urine samples of workers in a nuclear facility was used in our institute since 1988. A development of the system for remote control of uranium fluorescence analysis will be expected to contribute to an on-line uranium concentration monitoring in the cooling water of reconversion stream. The information related to fluorescence analyses and remote fluorescence monitoring methods established by foreign countries and our laboratory were summarized. A future research direction for remote on-line monitoring of uranium in conversion or reconversion processes was presented. DOE

N93-31866 Stanford Univ., CA. Edward L Ginzton Lab. of Physics.
RESEARCH STUDIES IN ELECTROMAGNETICALLY INDUCED TRANSPARENCY Annual Report, 15 Dec. 1991 - 14 Oct. 1992
S. E. Harris Apr. 1993 16 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-92-J-0066)
(AD-A264303; AFOSR-93-0307TR) Avail: CASI HC A03

To make an atom transparent at a given laser frequency, one applies a second laser whose frequency is equal to the difference of an otherwise empty state and the point in frequency space to which a probing laser is tuned. This type of transparency exhibits an essential nonreciprocity where, though absorption and refractive index may be negated, the nonlinear susceptibilities and coefficients for stimulated and spontaneous emission remain unchanged. We believe that there may be a new regime of nonlinear optics with special properties as resonances are approached. DTIC

N93-32019# Naval Research Lab., Washington, DC.
OPTICALLY GUIDED LASER WAKEFIELD ACCELERATION Interim Report
Eric Esarey, Phillip Sprangle, Jonathan Krall, Antonio Ting, and Glenn Joyce 19 Apr. 1993 29 p
(AD-A265441; NRL/MR/6790-93-7320) Avail: CASI HC A03/MF A01

The possibility of utilizing the fields of an intense laser beam to accelerate particles to high energies has attracted a great deal of interest. The study of laser driven accelerators is motivated by the ultrahigh fields associated with high intensity laser pulses. The peak amplitude of the transverse electric field of the laser pulse is given. A laser driven accelerator that has a number of attractive features is the laser wakefield accelerator (LWFA). In the LWFA, a short intense laser pulse propagates through an underdense plasma. The ponderomotive force associated with the laser pulse envelope expels electrons from the region of the laser pulse. If the laser pulse is sufficiently intense, virtually all of the plasma electrons will be expelled. When the laser pulse length is approximately equal to the plasma wavelength, large amplitude plasma waves (wakefields) will be excited with phase velocities approximately equal to the laser pulse group velocity. The axial and transverse electric fields associated with the wakefield can accelerate and focus a trailing electron beam. The ratio of the accelerating field, E sub z, to the laser field in the LWFA is given. DTIC

N93-32021# Naval Research Lab., Washington, DC.
REPORT OF THE WORKING GROUP ON FAR FIELD ACCELERATORS Interim Report
Cha-Mei Tang 23 Apr. 1993 16 p
(AD-A265443; NRL/MR/6791-93-7321) Avail: CASI HC A03/MF A01

This report describes the accomplishments of the Working Group on Far Field Accelerators. In addition to hearing presentations of current research, the group produced designs for 100 MeV demonstrations accelerators, 1 GeV conceptual accelerators, and a small electron beam source. Two of the 100 MeV designs, an Inverse Free Electron Laser (IFEL) and an Inverse Cerenkov Accelerator (ICA), use the CO2 laser and the 50 MeV linac at the Advanced Test Facility (ATF) at Brookhaven National Laboratory (BNL), requiring only the modest changes in the current experimental setups. By upgrading the laser, an ICA design demonstrated 1 GeV acceleration in a gas cell about 50 cm in length. For high average power accelerators, examples based on the IFEL concept were also produced utilizing accelerators driven by high average power FELs. The Working Group also designed a small electron beam source based on the inverse electron cyclotron resonance concept. Accelerators based on the IFEL and ICA may be the first to achieve 100 MeV and 1 GeV energy gain demonstration with high accelerating gradients. DTIC

N93-32052# New Mexico Univ., Albuquerque. Center for High Technology Materials.
OPTOELECTRONIC MATERIALS CENTER: A COLLABORATIVE PROGRAM INCLUDING UNIVERSITY OF NEW MEXICO, STANFORD UNIVERSITY AND CALIFORNIA INSTITUTE OF TECHNOLOGY Quarterly Report, 1 Oct. - 31 Dec. 1992
S. R. Brueck 4 May 1993 7 p
(Contract MDA972-90-C-0046; ARPA Order 7526)
(AD-A265575) Avail: CASI HC A02/MF A01

The Optoelectronic Materials Center is a collaborative program involving the University of New Mexico, Stanford University, and the California Institute of Technology. Sandia National Laboratories and MIT Lincoln Laboratory are also involved in this program under separate contract vehicles. This program emphasizes three main areas: (1) Diode-based visible sources; (2) Two-dimensional optical interconnects; and (3) High-speed optoelectronics. DTIC

N93-32180# Sandia National Labs., Albuquerque, NM.
SURFACE-EMITTING LASER-BASED OPTICAL SWITCHING: AN UPDATE
P. Zhou, J. Cheng, S. Z. Sun, S. Hersee, M. Osinski, J. Zolper, D. R. Meyers, and G. A. Vawter 1993 9 p Presented at the International Symposium on Advanced Electronic and Optoelectronic Materials, Los Angeles, CA, 20-23 Jan. 1993
(Contract DE-AC04-76DP-00789)
(DE93-010689; SAND-93-0436C; CONF-930135-4) Avail: CASI HC A02/MF A01

The properties of vertical-cavity surface-emitting lasers (VCSELS) and VCSEL-based optical switches using MOCVD-grown epitaxial material are discussed and summarized. Additionally, some of the factors that limit their performance are discussed. DOE

N93-32288# Midwest Research Inst., Golden, CO. National Renewable Energy Lab.
CUTTING PARAMETERS WITH LASAG LASERS
J. P. Kalejs 25 Mar. 1993 3 p Prepared in cooperation with Mobil Solar Energy Corp., Billerica, MA
(Contract DE-AC02-83CH-10093)
(DE93-010403; DOE/FTR-93010403) Avail: CASI HC A01/MF A01 (US Sales Only)

The objectives of the trip were to review lower-tier subcontractor's program (MSEC-18 with Lasag) and discuss future plans on Nd:YAG laser cutting program for thin EFG material. DOE

N93-32304# Pacific Northwest Lab., Richland, WA.
EXCITATION RATE AND BACKGROUND MEASUREMENTS DURING LIF STUDIES ON KRYPTON
C. A. Whitehead, B. D. Cannon, and J. F. Wacker Apr. 1993 21 p
(Contract DE-AC06-76RL-01830)
(DE93-013500; PNL-8629) Avail: CASI HC A03/MF A01

The Krypton Isotope Laser Analysis (KILA) method is being developed at the Pacific Northwest Laboratory (PNL) to measure Kr-85 concentrations in small air samples. The technique uses high-resolution lasers to excite individual isotopes of krypton specifically to induce Kr-85 to fluorescence for detection by optical means. Production of krypton metastables via two-photon excitation to the 2p(sub 6) state has been shown to be 0.15%

efficient in 0.13 mTorr of krypton--sufficiently high to demonstrate overall feasibility of the KILA method. Since this goal was met, focus has been directed toward development of a working vacuum ultraviolet (VUV) fluorescence detection system and toward understanding the VUV background. This report describes the progress made in these two areas. The second step of the KILA process is to optically pump all except the Kr-85 isotopes from the metastable state back to the ground state using laser-induced fluorescence (LIF). The rate of this process and the VUV background afterward will determine the sensitivity and selectivity of the KILA approach. De-excitation of the metastable population was accomplished via one-photon absorption of a continuous-wave (c-w) laser to the 2p(sub 8) energy level. Non-isotopically selective de-excitation rates as high as 5 x 10(exp 5)/sec have been measured, yielding a signal-to-background ratio of g reater than 10(exp 6). The lifetime of the metastables is 1.2 msec in 200 mTorr of neon--much longer than the time required to de-excite krypton metastables and to detect fluorescence produced by Kr-85. After attaining these high de-excitation rates, a gated VUV detection system was built with a dynamic range large enough to measure a small background following de-excitation of large metastable populations. Future experiments will focus on reducing the background level by another 2-3 orders of magnitude and perfecting the isotopically selective de-excitation technique with known samples. DOE

N93-32402# SRI International Corp., Menlo Park, CA.
OPTICAL AND KINETIC PROCESSES IN EXCIMER LASERS Final Report, 29 Mar. 1984 - 1 Mar. 1989
David L. Huestis, M. J. Dyer, W. K. Bischel, D. C. Lorents, and G. Black 14 Dec. 1992 232 p
(Contract N00014-84-C-0256)
(AD-A264210; SRI-MP-92-279; SRI-PYU-7123) Avail: CASI HC A11/MF A03

This report summarizes a program of research on optical and kinetic processes of importance for excimer laser systems. The research consists of four major topics: (1) investigations of the spectroscopy and chemical kinetics of XeF and XeCl lasers using theoretical techniques, synchrotron radiation excitation, and laser-induced fluorescence, (2) measurement of the angle, wavelength, temperature, and density dependencies of vibrational and rotational Raman gain in H2, D2, and N2, (3) studies of stimulated Rayleigh-Brillouin scattering in gases, and (4) investigation of other topics in lasers and nonlinear optics. DTIC

N93-31556*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
RAYLEIGH-BRILLOUIN SCATTERING FOR HIGH-PRESSURE GAS TEMPERATURE MEASUREMENTS
Richard G. Seasholtz *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 21-27 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

37 MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

N93-31101# Maryland Univ., College Park. Dept. of Mechanical Engineering.
ON THE FEASIBILITY OF A TRANSIENT DYNAMIC DESIGN ANALYSIS
Patrick F. Cunniff and Robert D. Pohland May 1993 43 p
(Contract N00014-91-J-4059)
(AD-A264882) Avail: CASI HC A03/MF A01

The Dynamic Design Analysis Method has been used for the past 30 years as part of the Navy's efforts to shock-harden heavy shipboard equipment. This method which has been validated several times employs normal mode theory and design shock values. This report examines the degree of success that may be achieved by using simple equipment-vehicle models that produce time history responses which are equivalent to the responses that would be achieved using spectral design values employed by the Dynamic Design Analysis Method. These transient models are constructed by attaching the equipment's modal oscillators to the vehicle which is composed of rigid masses and elastic springs. Two methods have been developed for constructing these transient models. Each method generates the parameters of the vehicles so as to approximate the required damaging effects, such that the transient model is excited by an idealized impulse applied to the vehicle mass to which the equipment modal oscillators are attached. The first method called the Direct Modeling Method, is limited to equipment with at most three-degrees of freedom and the vehicle consists of a single lumped mass and spring. The Optimization Modeling Method, which is based on the simplex method for optimization, has been used successfully with a variety of vehicle models and equipment sizes. DTIC

N93-31103 Stanford Univ., CA.
CONTACT MECHANICS AND THE DYNAMICS OF MANIPULATION Ph.D. Thesis
Prasad Narasimha Akella 1993 201 p
Avail: Univ. Microfilms Order No. DA9309567

Although a number of dextrous hands exist in research laboratories today, the application of such hands in practical manipulation tasks is essentially unexplored. There are several reasons for this situation, of which two of the most important are an insufficient understanding of manipulation processes and an inability to construct robust control strategies that will enable the hands to respond in a versatile way to unexpected manipulation events. The mechanics of contact when soft fingertips are used is addressed, these models are used in the dynamics of manipulation, and then the problem of contact force control is studied. Soft fingertips generally perform better than the kinematic idealizations proposed in recent research would indicate, allowing smaller gripping forces, providing stabler grasps, and dissipating energy from the system. These soft fingertips are created either by using urethane rubber or by filling robot fingers with powders or plastic fluids. Contact models, adapted from solid mechanics theory, were developed to represent such fingertips more realistically. The nature of these fingertips affects the dynamics of manipulation by dissipating energy. This dissipation of energy has an effect similar to that of adding damping or velocity feedback to the finger joints. The interest in this effect is in the context of simulating the dynamics, both steady state and transient, of manipulation. The issue of controlling the contact forces generated when the fingers of a dextrous device, such as the Stanford/JPL hand, first grasp an object is then addressed. 'Semi-active' fingertips are proposed as a means of enhancing the system performance and of solving the contact instability problem resulting from non-collocated sensors and actuators. The issue is studied in the context of a simple manipulation device, and analytical and simulation studies are provided to identify an 'ideal' fingertip to achieve a desirable performance. Optimizing the performance of more realistic fingers is investigated and preliminary experimental results that explore the use of Electro-Rheological fluids as prototypical materials for building such active fingertips are provided. It is suggested that while soft fingertips are better than hard ones, 'semi-active and active' soft fingertips, whose damping can be varied, perform even better. Dissert. Abstr.

N93-31150# Oxford Univ. (England). Dept. of Engineering Science.
ANALYSIS OF THE COMPLIANT MOTION ACHIEVABLE WITH AN INDUSTRIAL ROBOT: IDENTIFICATION, FEEDBACK AND DESIGN Ph.D. Thesis
Paul Elosegui 1991 276 p Sponsored by Basque Regional Authorities, Spain
(OUEL-1899/91; ETN-93-94225) Copyright Avail: CASI HC A13/MF A03

The compliant motion capabilities of an industrial robot system are investigated. The emphasis of the work is on quantifying and diagnosing the performance limits. The approach relies on experiments conducted in an enhanced PUMA 560. There are three distinct parts to the work: identification, feedback, and design. To types of robot models were developed: a spatial mass compliance model, and a transfer function model. The spatial model is generated through an experimental modal analysis of the PUMA 560. The transfer functions for end tip force control are generated by direct identification techniques. Based on the identified transfer functions, feedback controllers are designed to realize the limit compliance motion capabilities. These are quantified through the dynamic endtip impedance. The effect on performance of drive system friction, different feedback schemes, and joint torque feedback is provided by the impedance measurements. In addition to achievable impedance, controller robustness to changes in the plant is a critical specification. The controller design

concludes by pinpointing the transfer function characteristics responsible for the limitations. The diagnosis is completed using the spatial model of the robot. Subsequently, the diagnosis is turned into robot design guidelines to improve performance. Although these guidelines specifically concern the electrical and mechanical parts of the PUMA 560, the study is also relevant to other robots. ESA

N93-31156# Oxford Univ. (England). Dept. of Engineering Science.
CHARACTERISATION AND CONTROL OF A FLEXIBLE ROBOT SUBJECT TO TORQUE RIPPLE Ph.D. Thesis
Jose Ignacio Arocena 1992 244 p Sponsored by United Kingdom Science and Engineering Research Council
(OUEL-1952/92; ETN-93-94228) Avail: CASI HC A11/MF A03

The investigation is part of a project which included the design and control of a new type of robot and aimed at investigating the problem of contact with hard surfaces and end tip vibration control during motions. The project was motivated by the unsatisfactory results obtained by passive compliance methods. The manipulator used includes compliance as a design feature in the controllable directions while being mechanically stiff against orthogonal link motion. A two level control system is shown to control the vibrations and to provide trajectory tracking. The modeling and identification process reveals a series of nonlinearities particularly affecting flexible manipulators. Some identification techniques are shown to be affected by such nonlinearities, especially backlash, and systematically fail. Robust identification techniques are used to overcome this problem. Torque ripple generated by the Switched Reluctance (SR) direct drive motors is demonstrated to be the most problematic of all. Such torque ripple, its frequency changing with velocity, excites the vibrational modes of the arm. It is argued that the complexity of the SR torque ripple mechanism prevents open loop compensation and the only potential solution is to use feedback, based on strain gauge sensors. The joint servos use a strain feedback inner loop controller in each link transmission to control vibrations. Grid disturbance rejection, which attenuates torque ripple and other nonlinearities, is demonstrated. A simple rigid body inverse dynamic controller is then demonstrated to provide good trajectory tracking for the joint strain servoed arm. ESA

N93-31292*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
GAS ARC CONSTRICTION FOR PLASMA ARC WELDING Patent Application
Daniel J. Rybicki, inventor (to NASA) (Martin Marietta Space Systems, Inc., Huntsville, AL.) and William F. McGee, inventor (to NASA) (Martin Marietta Space Systems, Inc., Huntsville, AL.) 25 Jun. 1993 10 p
(NASA-Case-MFS-28844-1; NAS 1.77:MFS-28844-1;
US-Patent-Appl-SN-081890) Avail: CASI HC A02/MF A01

A welding torch for plasma arc welding apparatus has an inert gas applied circumferentially about the arc column externally of the constricting nozzle so as to apply a constricting force on the arc after it has exited the nozzle orifice and downstream of the auxiliary shielding gas. The constricting inert gas is supplied to a plenum chamber about the body of the torch and exits through a series of circumferentially disposed orifices in an annular wall forming a closure at the forward end of the constricting gas plenum chamber. The constricting force of the circumferential gas flow about the arc concentrates and focuses the arc column into a more narrow and dense column of energy after exiting the nozzle orifice so that the arc better retains its energy density prior to contacting the workpiece. NASA

N93-31313*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
TURNTABLE MECHANISM Patent Application
William Neill Myers, inventor (to NASA) 31 Jan. 1992 19 p
(NASA-Case-MFS-28522-1; NAS 1.71:MFS-28522-1;
US-Patent-Appl-SN-828612) Avail: CASI HC A03/MF A01

In vacuum plasma spraying a turntable must be provided which not only makes it possible to rotate and tilt a heavy workpiece, but to operate at vacuum plasma temperatures to do so. In the vacuum plasma coating of large parts such as combustion chambers of rocket engines, the workpiece must not only be rotated, but it must be tilted. Hence, the turntable must be capable not only of supporting heavy parts, but of angulating such heavy workpieces. And this must be done without drive means failure due to extremely high temperatures under which the turntable mechanism is operated. A turntable mechanism is provided which is capable of operating under such conditions. For cooling the turntable drive mechanism, internal cooling means are included. NASA

N93-31314*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
SERVICE EQUIPMENT FOR USE IN HOSTILE ENVIRONMENTS Patent Application
James L. Dolce, inventor (to NASA) and Andrew L. Gordon, inventor (to NASA) (Analytical Engineering Corp., North Olmsted, OH.) 26 Jul. 1993 20 p
(NASA-Case-LEW-14906-2; NAS 1.71:LEW-14906-2;
US-Patent-Appl-SN-104951) Avail: CASI HC A03/MF A01

Service equipment for use in hostile environments includes a detachable service unit secured to a stationary service unit. The detachable service unit includes a housing with an exterior plate, a power control interface for connection to an exterior power source, locating pins located in said exterior plate, an electrical connector in the exterior plate electrically coupled to said power control interface, and a pair of clamping receptacles formed in the exterior plate and located on adjacent opposite edges of the exterior plate. The stationary unit includes an electrical connector for connection to the electrical connector of the detachable service unit, a clamping apparatus for clamping and unclamping the detachable service unit from the stationary unit, a base clamp assembly for mounting the clamping apparatus onto the stationary unit, and locating pin holes for receiving the locating pins and aligning the detachable service unit onto the stationary unit. The detachable service unit and stationary unit have mating scalloped faces which aid in alignment and provide a mechanism for heat dissipation. NASA

N93-31317*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
SPLIT RAIL GRIPPER ASSEMBLY AND TOOL DRIVER THEREFOR Patent Application
George M. Voellmer, inventor (to NASA) 15 Feb. 1991 18 p
(NASA-Case-GSC-13370-1; NAS 1.71:GSC-13370-1;
US-Patent-Appl-SN-656924) Avail: CASI HC A03/MF A01

A split rail gripper for robotic apparatus, including a pair of rails which are driven in mutually opposite directions by a rack and pinion gear mechanism is presented. Each rail includes a set of rack gear teeth which engage respective pinion gears and where the top rail engaging one of the pinion gears is driven by a harmonic gear reduction drive and motor unit coupled to an acme screw. The other pinion gear is driven by the top pinion gear engaging a set of rack gear teeth included in the bottom rail. As the top rail is driven in or out, the upper pinion gear is rotated, causing the other pinion gear, in turn, to rotate in the opposite direction. This causes the bottom rail to move in an opposite linear direction relative to the top rail. An outwardly extending gripper finger assembly is attached to respective ends of the rails, with each gripper finger including an arrangement of vertically and horizontally mounted roller members which operate to automatically center and engage an H-plate type interface secured to the object being grasped. The gripper assembly also includes a base plate attached to an interface plate of a robotic tool changer mechanism. A retractable rotary tool driver and tool is also centrally mounted on the base plate. NASA

N93-31508# Technische Univ., Delft (Netherlands). Vehicle Research Lab.
THE DEVELOPMENT OF A RING MODEL FOR THE STUDY OF TIRE IN-PLANE DYNAMICS
Sunrong Gong Jan. 1992 35 p
(MEMT-20; ISBN-9-03-700062-2; ETN-93-94267) Copyright Avail: CASI HC A03/MF A01

A ring model for the study of tire in-plane dynamics is developed. The main feature of this model is its capability to study the vibrations of tire treadband as well as the vibration transmission properties of tires. The natural frequencies and modes of the model are analyzed and numerical examples are given. The equations of motion are generalized by introducing the modal expansion method so that the use of this ring model in vehicle and tire dynamics studies becomes simpler and practical. Two examples

are presented to illustrate the application prospects of this ring model in the study of tire dynamics. ESA

N93-31526# Universiteit Twente, Enschede (Netherlands). Faculty of Applied Mathematics.
SENSITIVITY ANALYSIS OF COUPLED BENDING AND TORSIONAL VIBRATIONS IN FLEXIBLE ROBOT ARMS
M. Vajta Oct. 1992 10 p Presented at IFTOMM (International Federation for Theory of Machines and Mechanisms) International Symposium on Theory of Machines and Mechanisms, Nagoya, Japan, 24-26 Sep. 1992
(MEMO-1088; ETN-93-94128) Avail: CASI HC A02/MF A01

A sensitivity analysis of coupled bending and torsional vibrations in flexible robot arms due to an asymmetric tip body is presented. To describe the beam dynamics and the rigid appendage (payload or tip body), an Euler-Bernoulli model is considered with Voigt type of internal damping. Different damping terms in bending and in torsion were assumed, respectively. The exact solutions in the frequency domain (the so called distributed transfer functions) are provided and some of their interesting properties are shown, among other things a pole cancellation effect due to the torsional vibration. The system dynamics depend on the payload parameter in a nonlinear way, but based on the exact solutions, the logarithmic parameter sensitivity functions can be developed and their properties can be investigated. ESA

N93-31592# Martin Marietta Corp., Washington, DC.
MAGLEV GUIDEWAY ROUTE ALIGNMENT AND RIGHT-OF-WAY REQUIREMENTS
S. Carlton and T. Andriola Dec. 1992 147 p
(Contract DTFR53-91-C-00046)
(PB93-154854; FRA-24-92-0014; DOT/FRA/NMI-92/10) Avail: CASI HC A07/MF A02

The use of existing rights-of-way (ROW) is assessed for maglev systems by estimating trip times and land acquisition requirements for potential maglev corridors while meeting passenger comfort limits. Right-of-way excursions improve trip time but incur a cost for purchasing land. The final report documents findings of the eight tasks in establishing right-of-way feasibility by examining three city-pair corridors in detail and developing an approximation method for estimating route length and travel times in 20 additional city-pair corridor portions and 21 new corridors. The use of routes independent of existing railroad or highway right-of-way have trip time advantages and significantly reduce the need for aggressive guideway geometries on intercity corridors. Selection of the appropriate alignment is determined by many corridor specific issues. Use of existing intercity rights-of-way may be appropriate for parts of routes on a corridor-specific basis and for urban penetration where vehicle speeds are likely to be reduced by policy due to noise and safety considerations, and where land acquisition costs are high. Detailed aspects of available rights-of-way, land acquisition costs, geotechnical issues, land use, and population centers must be examined in more detail on a specific corridor basis before the proper or best maglev alignment can be chosen. NTIS

N93-31727 Massachusetts Inst. of Tech., Cambridge.
LOW COST GUIDEWAYS TO MAGLEV Final Report, Jun. 1991 - Aug. 1992
R. S. Phelan, R. D. Thornton, J. J. Connor, and T. Triantafillou Oct. 1992 160 p See also PB93-154821 Sponsored by National Maglev Initiative (FRA), Washington, DC Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DTFR53-91-C-00076)
(PB93-154847; DOT/FRA/NMI-92/16) Avail: Issuing Activity (National Technical Information Service (NTIS))

The report presents results of research aimed at developing structural requirements for a guideway to be used for maglev systems. The work progresses from initial conceptual design to refined structural and cost analyses. The design begins by identifying structural requirements including criteria for geometry, loads deflections, durability, toughness, fatigue and magnetic inertness. Proposed construction methods are analyzed to determine the impact that the choice of method has on both the cost and structural design of the guideway. A conceptual design follows in which the candidate cross sectional shapes and materials are compared. Results of these comparisons are then used for the optimal preliminary analysis and design. The analysis and design process, based on American Concrete Institute design procedures, is incorporated into a spreadsheet analysis program. The spreadsheet program is then used to determine preliminary design specifications and cost estimates. Sensitivity analyses are also carried out to determine optimal design specifications. A refined analysis is conducted focusing on how the dynamic behavior of the beam effects the preliminary design choices. A cost comparison is made based on the results of the refined analysis. Additional work includes discussions of automated control and magnetic forces on metallic components of guideways. Also, hybrid reinforced concrete beams reinforced with fiber reinforced plastic (FRP) rods were cast and tested to address the possibilities of using FRP rods in maglev guideways. Results of these tests are presented. NTIS

N93-31731*# Rotordynamics-Seal Research, Inc., Simi Valley, CA.
DESIGN REVIEW OF FLUID FILM BEARING TESTERS Final Report, 5 May - 22 Jul. 1993
Joseph K. Scharrer 22 Jul. 1993 76 p Sponsored by NASA. Lewis Research Center
(NASA Order PR-537313)
(NASA-CR-193299; NAS 1.26:193299; RSR-C003-93) Avail: CASI HC A05/MF A01

The designs of three existing testers (Hybrid Bearing Tester, OTV Bearing Tester, and Long Life Bearing Tester) owned by NASA were reviewed for their capability to serve as a multi-purpose cryogenic fluid film bearing tester. The primary tester function is the validation of analytical predictions for fluid film bearing steady state and dynamic performance. Evaluation criteria were established for test bearing configurations, test fluids, instrumentation, and test objectives. Each tester was evaluated with respect to these criteria. A determination was made of design improvements which would allow the testers to meet the stated criteria. The cost and time required to make the design changes were estimated. A recommendation based on the results of this study was made to proceed with the Hybrid Bearing Tester. Author (revised)

N93-31790# Sandia National Labs., Albuquerque, NM.
WELDING AND METALLURGY
G. A. Knorovsky, M. F. Smith, and P. W. Fuerschbach 3 Dec. 1992 11 p
(Contract DE-AC04-76DP-00789)
(DE93-010926; DOE/FTR-93010926) Avail: CASI HC A03/MF A01 (US Sales Only)

This document presents a description of the traveler's interactions with personnel at the various facilities visited, the new equipment becoming available or programs of research underway, and possible benefits to programs proposed or underway at SNL. Information is also presented concerning possible fruitful areas of collaboration, and where possible, compare the foreign facility's level of technology with respect to domestic industry. DOE

N93-31846*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
EFFICIENT FAULT DIAGNOSIS OF HELICOPTER GEARBOXES
H. Chin (Massachusetts Univ., Amherst.), K. Danai (Massachusetts Univ., Amherst.), and D. G. Lewicki Jul. 1993 6 p Proposed for presentation at the 12th World Congress International Federation of Automatic Control, Sydney, Australia 19-23 Jul. 1993
(DA Proj. 1L1-62211-A-47-A; RTOP 505-62-10)
(NASA-TM-106253; E-7975; NAS 1.15:106253; AVSCOM-TR-92-C-034)
Avail: CASI HC A02/MF A01

Application of a diagnostic system to a helicopter gearbox is presented. The diagnostic system is a nonparametric pattern classifier that uses a multi-valued influence matrix (MVIM) as its diagnostic model and benefits from a fast learning algorithm that enables it to estimate its diagnostic model from a small number of measurement-fault data. To test this diagnostic system, vibration measurements were collected from a helicopter gearbox test stand during accelerated fatigue tests and at various fault instances. The diagnostic results indicate that the MVIM system can accurately detect and diagnose various gearbox faults so long as they are included in training. Author (revised)

N93-32069# Environmental Protection Agency, Ann Arbor, MI. Technological Development Group.

SPRAY CHARACTERISTICS OF TWO TYPES OF FUEL INJECTORS Technical Report

J. P. Hahn, F. J. Hamady, and K. H. Hellman Mar. 1993 15 p

(PB93-180859; EPA/AA/TDG-93/05) Avail: CASI HC A03/MF A01

The report describes the results of two types of fuel injectors intended for possible application in alcohol-fueled automotive engines. A laser diffraction technique was used to quantify the fuel spray droplet sizes and volume concentration for two different types of fuel injectors. NTIS

N93-32086# Martin Marietta Corp., Washington, DC. Air Traffic Systems Div.

MAGLEV GUIDEWAY AND ROUTE INTEGRITY REQUIREMENTS Comprehensive Report

S. Carlton and R. Whinnery Apr. 1992 67 p Sponsored by National Maglev Initiative (FRA), Washington, DC

(Contract DTFR53-91-C-00067)

(PB93-154870; DOT/FRA/NMI-92/04; AFRA-A31-92-0008) Avail: CASI HC A04/MF A01

New modes of travel imply new hazards and increased risk from old hazards. Lightweight magnetic levitation (maglev) vehicles, operated at high speed, may be subject to increased collision consequences, compared to conventional rail. This suggests examination of sensor systems and automation. The final report summarizes potential safety risks in proposed high-speed maglev transportation systems, examines the prospect for sensor-based mitigation of these risks, and describes a communications architecture to integrate sensor data for control actions. The identified hazards, and their associated risk assessments, are useful for risk mitigation strategy definition and will support analyses during the early phases of system development. The information provided will also support the development of system safety requirements and performance and design specifications. The report is a summary of three interim reports. NTIS

N93-32179# Oak Ridge National Lab., TN.

FAST FOURIER TRANSFORM ANALYSIS OF COMPUTER-ACQUIRED FRICTION DATA

C. S. Yust 1993 20 p Presented at the Annual Conference and Exhibition of the Society of Tribologists and Lubrication Engineers, Calgary, Ottawa, 17-20 May 1993

(Contract DE-AC05-84OR-21400)

(DE93-010337; CONF-930513-2) Avail: CASI HC A03/MF A01

A commercial computer program for data acquisition and analysis has been used to facilitate the evaluation of the frequency content of friction force data obtained from a sliding wear test. The program uses a Fast Fourier Transform (FFT) algorithm to calculate the frequency spectrum of the friction force. The validity of the FFT program has been demonstrated by applying it to a recently published example that used a detailed mathematical treatment to remove an oscillatory component from friction data. When applied to friction force data from a pin-on-disk sliding wear test of NBD 200 silicon nitride sliding on NBD 100 silicon nitride, filtering of the dominant frequencies revealed by the FFT method reduces both the general dispersion of the friction values and almost completely eliminates localized signal perturbations. Successive filtering steps permit the association of particular frequencies with observed signal disturbances. Although the mean friction value in this example is not greatly altered by the frequency filtering, knowledge of the existing vibration frequency components in the tribosystem is important for a complete interpretation of wear mechanisms and for characterization of the machine/specimen interaction. DOE

N93-32192# Massachusetts Inst. of Tech., Cambridge. Center for Transportation Studies.

INTERACTIONS BETWEEN MAGNETICALLY LEVITATED VEHICLES AND ELEVATED GUIDEWAY STRUCTURES Final Report, Jul. 1991 - Aug. 1992

D. N. Wormley, R. D. Thornton, S. H. Yu, and S. Cheng Jul. 1992 160 p See also PB91-129684 and PB92-163237 Sponsored by National Maglev Initiative (FRA), Washington, DC

(Contract DTFR53-91-C-00062)

(PB93-148542; DOT/FRA/NMI-92/23) Avail: CASI HC A08/MF A02

The dynamic performance characteristics of magnetically levitated vehicles and vehicle trains relating to ride quality and magnetic gap variations have been determined using computer simulation models for one-dimensional, two-dimensional, and finite length vehicles. These performance characteristics are based on vertical plane motions of vehicles with linear suspensions systems which represent a number of the characteristics of both electrodynamic system (EDS) and electromagnetic system (EMS) configurations. Vehicles traversing guideways which are characterized by random roughness, by discrete guideway disturbances which occur due to the construction of elevated structures, and by flexible guideway motions are considered. The studies of vehicle performance have identified the levels of guideway disturbances and/or flexibility which can be accommodated by various suspension configurations while meeting ride quality and magnetic gap variation constraints. Author

N93-32193# Harris, Miller, Miller and Hanson, Inc., Lexington, MA.

NOISE FROM HIGH SPEED MAGLEV SYSTEMS: NOISE SOURCES, NOISE CRITERIA, PRELIMINARY DESIGN GUIDELINES FOR NOISE CONTROL, AND RECOMMENDATIONS FOR ACOUSTICAL TEST FACILITY FOR MAGLEV RESEARCH Final Report, Jul. 1991 - Oct. 1992

C. E. Hanson, P. Abbot, and I. Dyer Jan. 1993 171 p Sponsored by National Maglev Initiative (FRA), Washington, DC Prepared in cooperation with Oasis, Lexington, MA

(Contract DTFR53-91-C-00074)

(PB93-154896; DOT/FRA/NMI-92/18; HMMH-291550) Avail: CASI HC A08/MF A02

Noise levels from magnetically-levitated trains (maglev) at very high speed may be high enough to cause environmental noise impact in residential areas. Aeroacoustic sources dominate the sound at high speeds and guideway vibrations generate noticeable sound at low speed. In addition to high noise levels, the startle effect as a result of sudden onset of sound from a rapidly moving nearby maglev vehicle may lead to increased annoyance to neighbors of a maglev system. The report provides a base for determining the noise consequences and potential mitigation for a high speed maglev system in populated areas of the United States. Four areas are included in the study: (1) definition of noise sources; (2) development of noise criteria; (3) development of design guidelines; and (4) recommendations for a noise testing facility. Author

N93-32194# Martin Marietta Corp., Washington, DC. Air Traffic Systems Div.

MAGLEV PROGRAM TEST PLAN Final Report

D. deBenedet, A. J. Gilchrist, and L. A. Karanian Jul. 1992 123 p Sponsored by National Maglev Initiative (FRA), Washington, DC

(Contract DTFR53-91-C-00071)

(PB93-154904; DOT/FRA/NMI-92/11; FRA-24-92-0012) Avail: CASI HC A06/MF A02

Maglev systems represent a promising evolution in the high-speed ground transportation, offering speeds in excess of 300 mph along with the potential for low operating costs and minimal environmental impact. The goal of this effort is to investigate the feasibility and viability of maglev systems in the United States. The emergence of a sophisticated technology such as maglev requires a need for a coordinated research test program and the determination of test requirements to identify and mitigate development risk and to maximize the use of domestic resources. The study is directed toward the identification and characterization of maglev systems development risks tied to a preliminary system architecture. Research objectives are accomplished by surveying experiences from previous maglev development programs both foreign and domestic, and interviews with individuals involved with maglev research and testing. Findings include ninety-four distinct development risks and twenty risk types. Planning and implementation requirements are identified for a maglev test program, including the development of a facilities strategy to meet any operational concept that evolves out of early development effort. Also specified is the logical development flow and associated long-lead support needs for sub-scale and full-scale testing. Author

N93-32204# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.

CONSTRAINED MOTION MODELS FOR INSERTION/EXTRACTION OPERATIONS APPLIED TO THE HERMES ROBOT ARM: A FEASIBILITY STUDY

A. A. tenDam and M. J. H. Couwenberg 30 Dec. 1991 60 p
(Contract NIVR-02506N)
(NLR-TP-91485-U; ETN-93-94077; AD-B169116L) Copyright Avail: CASI HC A04/MF A01

The feasibility of modeling insertion and extraction operations of the Hermes robot arm, using constrained motion models, is investigated. During operations with a manipulator arm situations will occur where the manipulator end effector is, or comes, in contact with its environment. In case of the Hermes Robot Arm (HERA), contact with the environment may be planned. Operations like insertion and extraction of a tool from a tool rack, grappling of an Orbital Replaceable Unit (ORU), or insertion/extraction of an ORU from the payload rack will lead to planned contact. Another operation where planned contact is made is force exertion at a surface. Simulation of mechanical systems that are in contact with their environment is demanding, and is known to be liable to numerical instabilities. A method recently developed allows for stable numerical integration of dynamical systems subject to constraints. The models capture restrictions in, for instance, the position and orientation of the end effector of the manipulator. Previous studies with mechanical systems as well as with the HERA showed good results. A logical follow up of these studies is the simulation of insertion/extraction operations. ESA

N93-32235*# McDonnell-Douglas Space Systems Co., Cocoa Beach, FL. Advanced Automation Technologies Dept.
GROUND ROBOTIC HAND APPLICATIONS FOR THE SPACE PROGRAM STUDY (GRASP) Final Report
William A. Grissom and Nader I. Rafla, ed. Apr. 1992 197 p Prepared in cooperation with Central State Univ., Wilberforce, OH and North Carolina Agricultural State Univ., Greensboro
(Grant NAG1-763)
(NASA-CR-193571; NAS 1.26:193571) Avail: CASI HC A09/MF A03

This document reports on a NASA-STDP effort to address research interests of the NASA Kennedy Space Center (KSC) through a study entitled, Ground Robotic-Hand Applications for the Space Program (GRASP). The primary objective of the GRASP study was to identify beneficial applications of specialized end-effectors and robotic hand devices for automating any ground operations which are performed at the Kennedy Space Center. Thus, operations for expendable vehicles, the Space Shuttle and its components, and all payloads were included in the study. Typical benefits of automating operations, or augmenting human operators performing physical tasks, include: reduced costs; enhanced safety and reliability; and reduced processing turnaround time. Author

N93-32333# National Aerospace Lab., Amsterdam (Netherlands). Systems Div.
MODIFIED DYNAMICS MODELLING FOR MANEUVERING FLEXIBLE SPACE MANIPULATORS
P. T. L. M. vanWoerkom 16 Jul. 1991 15 p Presented at the 42nd International Astronautical Federation Congress, Montreal, Canada, 7-11 Oct. 1991
(Contract NIVR-02506N)
(NLR-TP-91280-U; IAF-91-356; ETN-93-94066; AD-B169111L) Copyright Avail: CASI HC A03/MF A01

The dynamics of flexible space manipulators carrying out relatively fast maneuvers are discussed. Computer simulations of the dynamics of flexible space manipulators executing large movements sometimes lacked in accuracy, especially during fast maneuvers. This deficiency can be attributed to the neglected second order terms in the deformation field of the flexible links in the manipulator multibody system. Several modeling techniques can be used to improve flexible space manipulators dynamics algorithms. These are nonlinear deformation field modeling, perturbed dynamics modeling, fictitious joints modeling, and bracket joints modeling. These four modeling techniques are explained in an application to a single link manipulator. Analytical and numerical results are presented. The four modeling techniques are assessed. ESA

N93-31452*# McDonnell-Douglas Space Systems Co., Houston, TX.
ACTIVE DAMPING IN A FLEXIBLE MANIPULATOR
Trung T. Pham *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 373-381 (For primary document see N93-31439 12-18)
Avail: CASI HC A02/MF A04

N93-31584*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THREE-DIMENSIONAL ANALYSIS OF THE PRATT AND WHITNEY ALTERNATE DESIGN SSME FUEL TURBINE
K. R. Kirtley (Sverdrup Technology, Inc., Brook Park, OH.), T. A. Beach (Sverdrup Technology, Inc., Brook Park, OH.), and J. J. Adamczyk *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 255-262 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

N93-31586*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
LOCALIZATION OF AEROELASTIC MODES IN MISTUNED HIGH-ENERGY TURBINES
Todd E. Smith (Sverdrup Technology, Inc., Brook Park, OH.), Christophe Pierre (Michigan Univ., Ann Arbor.), and Durbha V. Murthy (Toledo Univ., OH.) *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 273-280 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

N93-31587*# Calspan-Buffalo Univ. Research Center, NY.
HEAT TRANSFER AND PRESSURE MEASUREMENTS FOR THE SSME FUEL TURBINE
Michael G. Dunn and Jungho Kim *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 281-282 (For primary document see N93-31552 12-20)
Avail: CASI HC A01/MF A03

N93-32115*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PLANETARY ROVER DEVELOPMENTS AT JPL Abstract only
Brian Wilcox *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 172 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

N93-32116*# Oak Ridge National Lab., TN. Center for Engineering Systems Advanced Research.
REAL-TIME QUALITATIVE REASONING FOR TELEROBOTIC SYSTEMS Abstract only
Eancois G. Pin *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 173 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

N93-32117*# Sandia National Labs., Albuquerque, NM.
RATLER: ROBOTIC ALL-TERRAIN LUNAR EXPLORATION ROVER
J. W. Purvis and P. R. Klarer *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 174-179 Previously announced as N93-11502 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32120*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
POTENTIAL LOW-COST TELEROBOTICS FLIGHT EXPERIMENTS Abstract only
Brian Wilcox *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 190 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

N93-32125*# Texas Univ., Austin. Dept. of Mechanical Engineering.
ON THE DESIGN OF FAULT-TOLERANT ROBOTIC MANIPULATOR SYSTEMS Abstract only
Delbert Tesar *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 223 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

N93-32275# Kaiserslautern Univ. (Germany).
EXCITATION BY FLOWS IN SEALS AND CLEARANCES. PART 1: INTRODUCTION: FLUID-STRUCTURE-INTERACTIONS IN ROTORDYNAMICS. PART 2: IDENTIFICATION OF ROTORDYNAMIC COEFFICIENTS OF ANNULAR SEALS
R. Nordmann *In* VKI, Vibration and Rotor Dynamics 1992 68 p
(For primary document see N93-32270 12-39)
Copyright Avail: CASI HC A04/MF A04

N93-32276# Bently Rotor Dynamics Research Corp., Minden, NV.
ONE LATERAL MODE ISOTROPIC ROTOR RESPONSE TO NONSYNCHRONOUS EXCITATION
A. Muszynska *In* VKI, Vibration and Rotor Dynamics 1992 31 p
(For primary document see N93-32270 12-39)
Copyright Avail: CASI HC A03/MF A04

N93-32277# Bently Rotor Dynamics Research Corp., Minden, NV.
PERTURBATION TECHNIQUE FOR IDENTIFICATION OF THE LOWEST MODES OF ROTORS WITH FLUID INTERACTION
A. Muszynska *In* VKI, Vibration and Rotor Dynamics 1992 36 p
(For primary document see N93-32270 12-39)
Copyright Avail: CASI HC A03/MF A04

N93-32278# Bently Rotor Dynamics Research Corp., Minden, NV.
VIBRATIONAL DIAGNOSTICS OF ROTATING MACHINERY MALFUNCTIONS
A. Muszynska *In* VKI, Vibration and Rotor Dynamics 1992 40 p
(For primary document see N93-32270 12-39)
Copyright Avail: CASI HC A03/MF A04

N93-32279# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. of Robots.
DESIGN AND APPLICATION OF ACTIVE MAGNETIC BEARINGS (AMB) FOR VIBRATION CONTROL
Roland Siegwart *In* VKI, Vibration and Rotor Dynamics 1992 64 p
(For primary document see N93-32270 12-39)
Copyright Avail: CASI HC A04/MF A04

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N93-31107 Iowa Univ., Iowa City.
AUTOMATED FAILURE MODE EFFECTS AND CRITICALITY ANALYSES FOR RELIABILITY PREDICTION OF MULTIBODY MECHANICAL SYSTEMS Ph.D. Thesis
Alex Chih-Chien Chiang 1992 249 p
Avail: Univ. Microfilms Order No. DA9308042

Reliability is important to ensure both serviceability and safety of a mechanical system. A method for simulation-based Failure Mode Effects and Criticality Analysis (FMECA) for reliability prediction of mechanical systems is presented. This approach integrates recursive formulation for dynamic analysis, failure criteria for failure determination, graphics techniques for collision detection, and new techniques for modifying dynamics model during the simulation. The automated FMECA method developed consists of three libraries and a graphics collision detection technique. First, a library of mechanical failure modes is created using cause-effect relationships for mechanical failure modes. Second, a library of component failure criteria is constructed by collecting different material test data. Third, a library of simulation algorithms and supporting techniques is built by developing simulation technologies to perform FMECA for mechanical failure modes. In addition, the automated FMECA method uses the developed graphics software VDS for collision detection. Finally, this approach is used to investigate the consequences of four failure modes of a vehicle system. The difficulty in formulating mathematical expressions for a damaged mechanical system is resolved by manipulating the number of cut joint constraints and generalized coordinates to implicitly update the original system topology. Formulations for virtual joints are derived, as well as other new techniques to permit multiple failures during a dynamic simulation. A near-minimum set of generalized coordinates is thus retained throughout the dynamic simulation. Four general-purpose dynamics codes are implemented and effects of four mechanical failure modes of a mechanical system are investigated; suspension failure, joint degradation and breakage, joint stiction, and component yielding and breakage. Failure histories as well as Mean Time Between Failure (MTBF) and Mean Time To Failure (MTTF) are obtained. The automated FMECA method developed identifies critical components, critical failure modes, and operating limits of a mechanical system. This information can be used to redesign the critical components, thereby improving the reliability of a mechanical system. Automated FMECA also supports a failure reporting and corrective action system (FRACAS), and the test-analyze-and-fix (TAAF) methodology, and minimization of cost for both hard-prototype building and field tests.
Dissert. Abstr.

N93-31172# Technical Research Centre of Finland, Espoo. Metals Lab.
CALIBRATION SYSTEM FOR TESTING LABORATORY [LABORATORION KALIBROINTIJAERJESTELMAE]
Matti Aaltio and Juha Sillanpaeae Sep. 1992 70 p In FINNISH
(VTT-TIED-1401; ISBN-9-51-3845215; ETN-93-94016) Copyright Avail: CASI HC A04/MF A01

The principles for developing a calibration system for laboratories, calibration procedures and working instructions needed, the choice of traceable quantities which should be calibrated, the choice of calibration accuracy, and the determination of the calibration intervals, are clarified. The calibration system requirements for the most important standards are presented, and calibration services available are described. There are a few examples of calibration instructions and the measuring uncertainties of common measuring equipment in the appendices of the report. More information on calibration systems and requirements can be found in the literature listed at the end of the report. ESA

N93-31982# General Electric Co., Cincinnati, OH. Aircraft Engine Technical Div.
INTERNAL STRUCTURAL CHARACTERIZATION Final Report, Sep. 1988 - Mar. 1992
R. Klaassen and M. Bashyam Aug. 1992 128 p
(AF Proj. 2418)
(AD-A264762; WL-TR-92-4079) Avail: CASI HC A07/MF A02

The nondestructive evaluation (NDE) techniques most appropriated for the detection of a variety of defects in metal and ceramic matrix composites (MMC and CMC's) are described. The NDE techniques that were investigated for application to these materials include acoustic microscopy, ultrasonic pulse-echo, ultrasonic through-transmission, ultrasonic velocity, ultrasonic backscatter, ultrasonic surface wave velocity, ultrasonic surface wave attenuation, film radiography, microtomographic radiography, and dual-energy microtomographic radiography. Types of defects for which optimized techniques are summarized include delaminations, broken fibers, fiber spacing, fiber orientation, fiber/matrix interface, matrix cracks, and voids/porosity. Further NDE development is needed for these materials in the areas of basic development for other NDE modalities, advanced development for nondestructive material characterization, and the scale-up of proven NDE techniques for full scale components, to accommodate cost and geometry limitations. DTIC

N93-31563*# Southwest Research Inst., San Antonio, TX.
STRUCTURAL RELIABILITY METHODS: CODE DEVELOPMENT STATUS
Harry R. Millwater, Ben H. Thacker, Y.-T. Wu, and T. A. Cruse (Vanderbilt Univ., Nashville, TN.) *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 71-75 (For primary document see N93-31552 12-20)
Avail: CASI HC A01/MF A03

N93-31568*# Vanderbilt Univ., Nashville, TN.
SYSTEM RELIABILITY AND RISK ASSESSMENT TASK GOALS AND STATUS
T. A. Cruse and S. Mahadevan *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 111-120 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

N93-31572*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
MAPPING METHODS FOR COMPUTATIONALLY EFFICIENT AND ACCURATE STRUCTURAL RELIABILITY
Michael C. Shiao (Sverdrup Technology, Inc., Brook Park, OH.) and Christos C. Chamis *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 145-158 (For primary document see N93-31552 12-20)
Avail: CASI HC A03/MF A03

N93-31574*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
OVERVIEW OF THE FATIGUE/FRACTURE/LIFE PREDICTION WORKING GROUP PROGRAM AT THE LEWIS RESEARCH CENTER Abstract Only
Michael A. McGaw *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 169-170 (For primary document see N93-31552 12-20)
Avail: CASI HC A01/MF A03

N93-32099*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REMOTE SURFACE INSPECTION SYSTEM
S. Hayati, J. Balaram, H. Seraji, W. S. Kim, K. Tso (SoHaR, Inc., Los Angeles, CA.), and V. Prasad (California Inst. of Tech., Pasadena.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 9-27 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

N93-32138*# McDonnell-Douglas Space Systems Co., Houston, TX. Space Station Div.
IMPLEMENTING A REAL TIME REASONING SYSTEM FOR ROBUST DIAGNOSIS
Tim Hill, William Morris, and Charlie Robertson *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 307-312 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N93-31057# Technische Univ., Brunswick (Germany). Fakultaet fuer Maschinenbau und Elektrotechnik.
DEFORMATION ANALYSIS OF WELDED JOINTS Ph.D. Thesis [VERFORMUNGSANALYSE VON SCHWEISSVERBINDUNGEN]
Uwe Paetzold 1992 144 p In GERMAN
(ETN-93-94199) Avail: CASI HC A07/MF A02

A strength calculation model for welded joints is presented. The model takes structural properties into consideration. Numerical parameters and their influence on calculation results were examined. Principles of finite element calculations were presented for an elastic-plastic analysis of welded joints. Experimental methods were developed for obtaining material characteristic values of different structural areas in heat affected zones and for evaluation of geometric distribution of these values. A process for fully automated determination of structural inhomogeneities in welded joints was presented. Measuring processes for dilatation and displacement were depicted. Comparison of calculation and measurement results show that the finite element method gives high spatial resolution values of position stress and strain. ESA

N93-31123# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.
OPTIMAL DESIGN AND IMPERFECTION SENSITIVITY OF NONLINEAR SHELL STRUCTURES
Ulf Ringertz Oct. 1992 34 p Sponsored by Foersvarets Materialverk, Stockholm, Sweden, and Swedish Board for Industrial and Technical Development
(FFA-TN-1992-30; ETN-93-94216) Avail: CASI HC A03/MF A01

Higher order optimality conditions used to analyze the imperfection sensitivity of thin shell structures are described. These are necessary since the structural behavior of such structures are in many cases known to be highly sensitive to small imperfections in geometry, boundary conditions, loading, and material properties. The higher order optimality conditions are given in a form suitable for large scale finite element analysis. The presentation is restricted to discretized structures for which the deformation can be described by a finite number of scalar parameters. It is well known that use of simplistic optimal design procedures may lead to structures with simultaneous buckling modes. Simultaneous buckling can in some cases lead to extremely imperfection sensitive structures. It is shown that structures with simultaneous buckling modes are not necessarily imperfection sensitive. Groebner bases are used for analyzing imperfection sensitivity when there are several simultaneous buckling modes. Numerical examples are used to illustrate some possible fallacies when analyzing the higher order optimality conditions. ESA

N93-31137 Virginia Polytechnic Inst. and State Univ., Blacksburg.
INTEGRATED STRUCTURAL DESIGN, VIBRATION CONTROL, AND AEROELASTIC TAILORING BY MULTIOBJECTIVE OPTIMIZATION Ph.D. Thesis
Robert Arthur Canfield 1992 172 p
Avail: Univ. Microfilms Order No. DA9310500

The integrated design of a structure and its control system was treated as a multiobjective optimization problem. Structural mass, a quadratic performance index, and the flutter speed constituted the vector objective function. The closed-loop performance index was taken as the time integral of the Hamiltonian. Constraints on natural frequencies and aeroelastic damping were also considered. Derivatives of the objective and constraint functions with respect to structural and control design variables were derived for a finite element beam model of the structure and constant feedback gains determined by Independent Modal Space Control. Pareto optimal designs generated for a simple beam and a tetrahedral truss demonstrated the benefit of solving the integrated structural and control optimization problem. The use of quasi-steady aerodynamic strip theory with a thin-wall box beam model showed that the integrated design for a high aspect ratio, unswept, straight, isotropic wing can be separable. Finally, an efficient modal solution of the flutter equation facilitated the aeroelastic tailoring of a low aspect ratio, forward swept, composite plate wing model.
Dissert. Abstr.

N93-31139 Pennsylvania State Univ., University Park.
THERMAL SHOCK AND FATIGUE BEHAVIOR OF CERAMIC TUBES Ph.D. Thesis
Albert Eliot Segall 1992 227 p
Avail: Univ. Microfilms Order No. DA9311719

A narrow circumferential gas (helium) external surface quench was used to thermally shock and fatigue internally heated alumina (AD998), reaction bonded (SCRB210), and sintered alpha (Hexoloy SA) silicon carbide tubes at 500 degrees C and 1000 degrees C. Transient temperature measurements required for thermal and stress calculations were obtained through the use of micro-thermocouples positioned along the internal surface of the tubes. Acoustic emissions were used for in situ monitoring of crack initiation and propagation of the resident flaw populations during single and repeated (up to 5) thermal shocks. Post test nondestructive visual, SEM, scanning acoustic microscopy, and destructive burst tests were used to correlate the existence, extent, and statistical (Weibull) nature of the damage induced by the thermal shock. Results indicated distinct fatigue behavior in the alumina. Fatigue mechanisms at less than critical stress intensity factors were evident in the reaction bonded silicon carbide. Large processing defects in the sintered alpha silicon carbide precluded conclusions pertaining to fatigue because of the large number of observed failures. In any case, the complex stress distributions computed from an FEA-based inverse heat transfer analysis were correlated to the observed damage (crack paths) and apparent fatigue behavior. Dissert. Abstr.

N93-31193*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

BLASIM: A COMPUTATIONAL TOOL TO ASSESS ICE IMPACT DAMAGE ON ENGINE BLADES

E. S. Reddy (Sverdrup Technology, Inc., Brook Park, OH.), G. H. Abumeri (Sverdrup Technology, Inc., Brook Park, OH.), and C. C. Chamis Apr. 1993 24 p Presented at the 34th Structures, Structural Dynamics and Materials Conference, La Jolla, CA, 19-22 Apr. 1993; sponsored by AIAA, ASME, ASCE, AHS, and ASC

(RTOP 509-10-11)

(NASA-TM-106225; E-7944; NAS 1.15:106225) Avail: CASI HC A03/MF A01

A portable computer called BLASIM was developed at NASA LeRC to assess ice impact damage on aircraft engine blades. In addition to ice impact analyses, the code also contains static, dynamic, resonance margin, and supersonic flutter analysis capabilities. Solid, hollow, superhybrid, and composite blades are supported. An optional preprocessor (input generator) was also developed to interactively generate input for BLASIM. The blade geometry can be defined using a series of airfoils at discrete input stations or by a finite element grid. The code employs a coarse, fixed finite element mesh containing triangular plate finite elements to minimize program execution time. Ice piece is modeled using an equivalent spherical objective that has a high velocity opposite that of the aircraft and parallel to the engine axis. For local impact damage assessment, the impact load is considered as a distributed force acting over a region around the impact point. The average radial strain of the finite elements along the leading edge is used as a measure of the local damage. To estimate damage at the blade root, the impact is treated as an impulse and a combined stress failure criteria is employed. Parametric studies of local and root ice impact damage, and post-impact dynamics are discussed for solid and composite blades. Author (revised)

N93-31428# European Space Agency, Paris (France).

PERFORATED CARBON-EPOXY PLATES DAMAGE MODELING FOR QUASI-STATIC BIAXIAL LOADING Ph.D. Thesis - Ecole Centrale des Arts at Manufactures, 1990

Thierry Jeggy (Office National d'Etudes et de Recherches Aerospatiales, Paris, France.) Jan. 1993 364 p Transl. into ENGLISH of Modelisation des Degradations des Plaques Trouees en Carbone/Epoxy sous Chargements Biaxiaux Quasi-Statiques (Paris, France, ONERA) 1991 p 1-301 Original language document was announced as N92-19931

(ESA-TT-1273; ONERA-NT-1991-1; ETN-93-93915) Avail: CASI HC A16/MF A03

The propagation of damage in perforated carbon/epoxy plates under various biaxial loadings was studied. The biaxial state is obtained through planar tensile/tensile stressing in two perpendicular directions. The damage is tracked during the test by means of x ray radiography with impregnation of an opacifying agent. A preliminary study of a layered composite tensile bar led on to the modeling of transverse cracking and fiber failure. The model of transverse cracking is based on a law deduced from a variation on the moduli of the cracked layer as a function of the transverse crack density. The criterion for fiber failure is a maximum strain criterion. A comparison between theory and various experiments is presented. These two models are introduced in a simplified manner, into a two dimensional finite element program in order to simulate numerically the propagation of these two modes of damage during the tests, and the tensile curve. A convergence study demonstrated the numerical stability of the approach developed. Comparison between calculation and tests for various stacking sequences is presented in respect of the tensile curves and the damage geometries. The calculations correctly approximate the initiation of damage and the axis of propagation. ESA

N93-31490# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

AN OPERATOR METHOD TO STUDY SOME RESONANCE BOUNDARY VALUE PROBLEMS IN ELASTICITY THEORY

S. A. Vavilov and E. Stepanov 1992 33 p

(Rept-92-84; ETN-93-94276) Copyright Avail: CASI HC A03/MF A01

Nonlinear resonance oscillations of Rayleigh beams are studied. Two sources of nonlinearities are considered: one due to the reaction of the foundation and the other due to the tension of the beam's neutral line. Nonlinearities arising due to the violation of Hooke's law are neglected. Mathematical methods to study time periodic vibrations are based on solutions of special operator sets of equations. The theorems on solvability of such sets of equations are formulated mainly on the basis of topological principles, though one of the theorems presented is based on the results from standard functional analysis. These theorems also provide algorithms to find solutions, one of them being based on Galerkin approximation scheme, the other on a simple iteration process. The applicability of abstract methods to other practical problems in the theory of elasticity is shown in an example of the stability of a shallow shell. ESA

N93-31645 Wichita State Univ., KS.

IMPACT RESPONSE OF LAMINATED PLATES SUBJECTED TO TRANSVERSE LOADING Ph.D. Thesis

Gum Ho Choe 1992 135 p

Avail: Univ. Microfilms Order No. DA9306134

This dissertation presents results of an analytical solution and comprehensive experimental program to investigate the impact response of laminated plates subjected to transverse loading. The objectives of the study were to develop an efficient method to predict the maximum impact force from the energy-balance model, and to assess the impact damage resistance. In the analytical study, the dynamic governing equations based on the classical laminate theory were expanded to obtain more generality. The derived equations of motion were solved in terms of natural frequency using Laplace transform. From Lagrangian equations of motion, the effective bending-shear stiffness of composite laminates was determined by using the fundamental natural frequency. This efficient approach can be used in place of the static compliance test conventionally conducted. A modified energy-balance model utilizing this stiffness predicted the maximum impact force at various impact energies using a numerical technique. Comprehensive experimental studies were performed utilizing the systematically designed instrumented drop weight tester to obtain the impact force vs characteristic time of the AS4/APC-2 thermoplastic and AS4/3501-6 thermoset laminates at various energies, specimen configurations, and stress states. The experimental program included the assessment of damage and the analysis of failure mechanisms by ultrasonic C-scan and scanning electron microscope, respectively. The maximum impact force obtained from the analytical solution agreed well with the experimental data up to a certain impact energy for thermoplastic laminates due to their linear elastic characteristics. The data for thermoset composites, however, were not compatible with the solution because of the reduced bending-shear stiffness. In the analysis of experimental results, higher impact force and shorter characteristic time were correlated with smaller damage size. Thus, these parameters could be substituted for traditional absorbed energy criteria in assessing the impact damage resistance. The failure mechanisms of the increased damage resistance resulted from fiber pull-out and fiber breakage rather than wide delaminations. The data obtained provide a basis for improved design and analysis of composite structures subjected to dynamic loading. Further, a model created for impact parameters in this research can be applied to various composite materials. Dissert. Abstr.

N93-31823# Korean Atomic Energy Research Inst., Daeduk (Republic of Korea).

THE DEVELOPMENT OF DETECTION TECHNIQUE FOR FATIGUE CRACK DUE TO THERMAL STRATIFICATION PHENOMENA IN RCS PIPING

Sam Lai Lee, Byoung Chul Kim, Hyung Taik Lim, Jong Po Lee, and Kee Ok Chang Jan. 1992 89 p In KOREAN

(DE93-605749; KAERI/RR-1048/91) Avail: CASI HC A05/MF A01 (US Sales Only)

Piping stress analysis was performed using computer code ANSYS in order to find the stress profile considering thermal stratification phenomena. This kind of analysis can be a useful tool to assist inspection engineers to choose the right method and area of inspection during in-service inspection of nuclear power plants. Mechanical fatigue cracks were generated in order to improve detection reliability of defect ultrasonically since the defects that were searched for are mostly related to fatigue cracks in pressurized water reactors. DOE

N93-32212*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

APPLICATIONS OF STRUCTURAL OPTIMIZATION METHODS TO FIXED-WING AIRCRAFT AND SPACECRAFT IN THE 1980S

Hirokazu Miura and Douglas J. Neill (Northrop Corp., Hawthorne, CA.) May 1992 42 p
(RTOP 505-69-50)
(NASA-TM-103939; A-92099; NAS 1.15:103939) Avail: CASI HC A03/MF A01

This report is the summary of a technical survey on the applications of structural optimization in the U.S. aerospace industry through the 1980s. Since applications to rotary wing aircraft will be covered by other literature, applications to fixed-wing aircraft and spacecraft were considered. It became clear that very significant progress has been made during this decade, indicating this technology is about to become one of the practical tools in computer aided structural design. Author

N93-32270# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
VIBRATION AND ROTOR DYNAMICS
1992 450 p Lecture series held in Rhode Saint Genese, Belgium, 21-25 Sep. 1992
(VKI-LS-1992-06; ETN-93-93981) Copyright Avail: CASI HC A19/MF A04

The structural dynamics of rotating assemblies is studied. The basic vibrational modes of individual turbomachinery blades and the extension to blade assemblies are discussed. The forced vibration response is considered and particular attention is given to the 'engine order' type of synchronous excitation. The mathematical modeling of the phenomena and modern analysis techniques are presented. Aero-excitation by the flow in seals and clearances, considering the local flow conditions and geometry, are considered. Magnetic bearings are a powerful tool to actively control the vibration of rotating components. A short description of bearing design, sensors and controller loop is followed by special topics such as critical speeds, measurements and system monitoring. Sweep frequency rotating force perturbation testing and vibration diagnostics are also addressed. For individual titles, see N93-32271 through N93-32279.

N93-32271# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
BASIC STRUCTURAL DYNAMICS
D. J. Ewins *In* VKI, Vibration and Rotor Dynamics 1992 15 p Repr. from AGARD Manual on Aeroelasticity in Axial-Flow Turbo Machines. Volume 2: Structural Dynamics and Aeroelasticity 14 p Previously announced as N89-10007 (For primary document see N93-32270 12-39)
Copyright Avail: CASI HC A03/MF A04

The concepts, the properties and appropriate analysis methods applicable to structural dynamics aspects are given. The first task of a structural dynamicist, which consists of formulating a suitable mathematical model, is discussed. The part taken by the finite element method in the formulation of the mathematical model is stressed. Following the modeling stage, a set of equations of motion is developed and solved in different forms to determine the characteristics required. Some of the analysis methods appropriate for dealing with the particular structural forms common in bladed assemblies are reviewed. ESA

N93-32272# Imperial Coll. of Science and Technology, London (England).
STRUCTURAL DYNAMIC CHARACTERISTICS OF INDIVIDUAL BLADES **c07**
D. J. Ewins and R. Henry (Institut National des Sciences Appliquees, Lyon, France.) *In* VKI, Vibration and Rotor Dynamics 1992 28 p Repr. from AGARD Manual on Aeroelasticity in Axial-Flow Turbo Machines. Volume 2: Structural Dynamics and Aeroelasticity 27 p Previously announced as N89-10008 (For primary document see N93-32270 12-39)
Copyright Avail: CASI HC A03/MF A04

The necessary introduction and grounding for a study of the vibrational characteristics of individual turbomachine blades are given. Only the structural dynamic properties are considered, and particular attention is given to the natural frequencies and the corresponding mode shapes. Before proceeding to a discussion of methods for predicting the structural dynamic properties of an individual turbomachine blade, the basic nature of these characteristics is summarized using simple models of blades. Further, the influence of a number of relevant design features is examined in order to establish parameters which have an effect on the actual values of natural frequency or mode shape. Prediction methods used for design calculations are included. ESA

N93-32273# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
STRUCTURAL DYNAMIC CHARACTERTISTICS OF BLADED ASSEMBLIES **c07**
D. J. Ewins *In* VKI, Vibration and Rotor Dynamics 1992 38 p Repr. from AGARD Manual on Aeroelasticity in Axial-Flow Turbo Machines. Volume 2: Structural Dynamics and Aeroelasticity 37 p Previously announced as N89-10009 (For primary document see N93-32270 12-39)
Copyright Avail: CASI HC A03/MF A04

The main features of the structural dynamic properties of blade assemblies are established. The patterns of both natural frequencies and mode shapes for various assemblies are illustrated and the major controlling factors in each case are identified. Simplified mathematical models of a bladed assembly are applied because they allow to perform the detailed parametric studies required to determine the behavior patterns. The following models are summarized: a basic model which admits a single degree of freedom for each blade and includes a simplified representation of the disk and/or shroud coupling; models based on simple beam and plate components; models containing few or no simplifications and based on finite element techniques. All these models are used for direct design predictions, but are inappropriate for exploratory studies, and are almost always limited to tubed and/or cyclically symmetric assemblies. ESA

N93-32274# Liege Univ. (Belgium).
VIBRATION ANALYSIS IN TURBOMACHINES **c07**
Michel Geradin, N. Kill, and J. C. Golinval *In* VKI, Vibration and Rotor Dynamics 1992 123 p Prepared in cooperation with Samtech S.A., Liege, Belgium (For primary document see N93-32270 12-39)
Copyright Avail: CASI HC A06/MF A04

The physical aspects of the mathematical models and the numerical methods applied to rotordynamics are discussed. Special attention is given to the physical aspects involving the breakdown of the rotating and fixed parts and of the interaction elements. The following formalisms are reviewed: the Hamilton's principle, the kinematics of rotating structures, the kinetic, the strain and the structural damping energy of rotating parts, the interaction elements and the system equations. The finite element discretization and the reduction methods are outlined. The numerical methods presented are the stability analysis, the harmonic and the transient response analysis. ESA

N93-32275# Kaiserslautern Univ. (Germany).
EXCITATION BY FLOWS IN SEALS AND CLEARANCES. PART 1: INTRODUCTION: FLUID-STRUCTURE-INTERACTIONS IN ROTORDYNAMICS. PART 2: IDENTIFICATION OF ROTORDYNAMIC COEFFICIENTS OF ANNULAR SEALS **c37**
R. Nordmann *In* VKI, Vibration and Rotor Dynamics 1992 68 p (For primary document see N93-32270 12-39)
Copyright Avail: CASI HC A04/MF A04

The fluid-structure interactions in rotor dynamics and the identification of rotor dynamic coefficients of annular seals are studied. The different fluid forces acting in the neck ring, the interstage seals, the balance pistons, the impellers and the oil film bearings of pumps are reviewed. These forces can have a large influence on the bending vibrations of a pump rotor. Theoretical and experimental models of fluid elements and of rotordynamics are presented. Simulations of the rotordynamic behavior show that the fluid forces of most elements can be described by linear-force relations. A theoretical model and an indentification procedure are presented to determine the dynamic coefficients of seals. The identified parameters confirm the assumptions in modeling and point out that the stiffness and damping characteristics of seals are significant for the stability behavior of pumps. ESA

N93-32276# Bently Rotor Dynamics Research Corp., Minden, NV.
ONE LATERAL MODE ISOTROPIC ROTOR RESPONSE TO NONSYNCHRONOUS EXCITATION **c37**
A. Muszynska *In* VKI, Vibration and Rotor Dynamics 1992 31 p

(For primary document see N93-32270 12-39)
Copyright Avail: CASI HC A03/MF A04

A one lateral mode rotor lateral vibrational response to constant radial preload force and to nonsynchronous (not related to the rotor rotative speed) harmonic sweep frequency rotational force excitation is described. The rotor response consists of free vibrations, lateral static displacements, and lateral harmonic excited vibrations. The nonsynchronous excitation is used in rotor modal parameter identification procedures. The existence of 'direct' and 'quadrature' resonances is presented. The analysis of the free vibrations provides natural frequencies and the threshold of stability. The concept of the complex dynamic stiffness is discussed. It is shown how the dynamic stiffness vectors vary in specific ranges of the excitation frequency. A stability margin based on the dynamic stiffness components is defined. A nonsynchronous amplification factor is introduced and possible model extensions are discussed. ESA

N93-32277# Bently Rotor Dynamics Research Corp., Minden, NV.
PERTURBATION TECHNIQUE FOR IDENTIFICATION OF THE LOWEST MODES OF ROTORS WITH FLUID INTERACTION **c37**
A. Muszynska *In* VKI, Vibration and Rotor Dynamics 1992 36 p
(For primary document see N93-32270 12-39)
Copyright Avail: CASI HC A03/MF A04

Modal testing of rotating machines has specific aspects. Classical model testing when applied to active (rotating) structures does not provide complete results. These aspects and specific application of sweep frequency circular input force perturbation testing of rotors rotating in fluid environment, are discussed. Nonsynchronous perturbation of shafts rotating at a constant rotative speed are emphasized. The results are presented in the direct and quadrature dynamic stiffness versus perturbation frequency formats. This perturbation technique provided: the identification of solid/fluid interaction modes; the identification of fluid dynamic forces in lightly loaded bearings and seals; and the multimode identification of rotor systems. Results of several laboratory rig experiments, the identification algorithm, and data processing techniques are discussed. A comparison with other testing methods is given. ESA

N93-32278# Bently Rotor Dynamics Research Corp., Minden, NV.
VIBRATIONAL DIAGNOSTICS OF ROTATING MACHINERY MALFUNCTIONS **c37**
A. Muszynska *In* VKI, Vibration and Rotor Dynamics 1992 40 p
(For primary document see N93-32270 12-39)
Copyright Avail: CASI HC A03/MF A04

The diagnostics of rotating machinery malfunction, using vibration data in correlation with operational process data is outlined. The advantages of vibration monitoring systems as a part of preventive/predictive maintenance programs are emphasized. The basic principles of machinery diagnostics, and several specific malfunction symptoms supported by simple mathematical models are given. These malfunctions include unbalance, excessive radial preload, rotor to stator rubbing, fluid induced vibrations, loose stationary and rotating parts, coupled torsional/lateral vibration excitation, and rotor cracking. The experimental results and actual field data illustrate the rotor vibration responses for individual malfunctions. Application of synchronous and nonsynchronous perturbation testing used for identification of basic dynamic characteristics of machinery is presented. Future advancements in vibration monitoring and diagnostics of rotating machinery health are discussed. The basic instrumentation for machine monitoring is outlined. ESA

N93-32279# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. of Robots.
DESIGN AND APPLICATION OF ACTIVE MAGNETIC BEARINGS (AMB) FOR VIBRATION CONTROL **c37**
Roland Siegwart *In* VKI, Vibration and Rotor Dynamics 1992 64 p
(For primary document see N93-32270 12-39)
Copyright Avail: CASI HC A04/MF A04

The basic principles and applications of Active Magnetic Bearing (AMB) presented give an introduction to magnetic bearing technology. The results of 15 years of research in AMB are summarized. An AMB can support a body by magnetic forces without any mechanical contact. The ferromagnetic forces are generated by permanent magnets or actively controlled electromagnets. The basic equations and control configurations of the AMB actuator are given. The efficiency of the displacement sensors used in an AMB is discussed. The importance in an AMB system's design of the rotor design and modeling are underlined. ESA

N93-32321# Polish Academy of Sciences, Warsaw. Inst. Podstawowych Problemow Techniki.
SOME ASPECTS OF INVARIANT THEORY IN PLASTICITY. PART 2: CONSTITUTIVE RELATIONS FOR PERFECTLY LOCKING MATERIALS. COMMENTS ON PERFECTLY PLASTIC SOLIDS
Stanislaw Jemiolo and Jozef Joachim Telega 1992 32 p
Avail: CASI HC A03/MF A01

The aim of this contribution is twofold. Firstly, by using the representation theory of isotropic tensor functions, general form of the constitutive relationship for perfectly locking materials is derived. The homogeneity condition of degree zero imposed on the locking behavior permits to obtain the general form of the locking locus. Some particular cases are also studied. Secondly, to account for the dissipation density dependent on hydrostatic pressure, the theory proposed by Sawczuk and Stutz is generalized. Consequently, incompressible behavior of isotropic perfectly plastic materials obeying pressure sensitive yield condition is described. Author (revised)

N93-32331# Sydney Univ. (Australia). Dept. of Aeronautical Engineering.
BUCKLING AND POSTBUCKLING OF STIFFENED THIN SKINNED CARBON FIBRE COMPOSITE PANELS
Brian G. Falzon and Grant P. Steven Jan. 1993 43 p
(ATN-9301) Avail: CASI HC A03/MF A01

Initial investigations into the manufacturing and testing of Stiffened Carbon Fiber Composite Panels for buckling and postbuckling strength are reported. Five panels were manufactured using different manufacturing techniques and a full description of these panels is given. All panels were tested to failure in an INSTRON compression testing machine. Buckling mode shapes were observed through the use of the Shadow Moire Fringe technique and strain measurements were obtained using resistive strain gauges. Linear finite element analysis was also carried out to compare predicted budding loads with experimental results. Author (revised)

N93-32340 Institute of Sound and Vibration Research, Southampton (England). Structures and Machinery Group.
VIBRATIONAL POWER TRANSMISSION IN CURVED BEAMS. PART 1: THEORY
S. J. Walsh Jun. 1992 49 p Sponsored in part by the Marine Technology Directorate Limited, the Science and Engineering Research Council and the Procurement Executive, Ministry of Defence
(ISVR-TR-208) Copyright Avail: Issuing Activity (Institute of Sound and Vibration Research, University of Southampton, Southampton SO9 5NH, England)

Previous research into structural vibration transmission paths has shown that it is possible to measure vibrational power transmission in simple beam and plate structures. However, in many practical structures transmission paths are composed of more complex curved elements; therefore, there is a need to extend vibrational power transmission analyses to this class of structure. Expressions are derived which describe the vibrational power transmission due to flexural, extensional, and shear types of traveling wave in a curved beam which has a constant radius of curvature. By assuming sinusoidal wave motion, expressions are developed which relate the time-averaged power transmission to the traveling wave amplitudes. The effect of (1) center-line extension, (2) shift of neutral axis location due to beam curvature, (3) rotary inertia, and (4) shear deformation are included in the governing equations, and their relevant contributions to the power transmission expressions identified. Author

N93-32384 National Physical Lab., Teddington (England). Materials Metrology Div.
EVALUATION OF THE CHEVRON NOTCH FRACTURE TOUGHNESS TEST FOR BRITTLE MATERIALS
J. M. Paddon and R. Morrell Jul. 1992 108 p
(NPL-DMM(A)-72; ETN-93-94032) Copyright Avail: Issuing Activity (National Physical Laboratory, Teddington, Middlesex, TW11 OLW, United Kingdom)

The results of the chevron notch beam fracture toughness test in ceramic and hard metal materials are reported. The purpose of the

experiments were to investigate the influence on the apparent fracture toughness of the test piece preparation, the test geometry, the jig-stiffness, the test rate, and the rising crack resistance of propagation. The main conclusions were: the results of the tests are not sensitive to test geometry provided that the loading arm to depth ratio does not fall below 1.3; single sided chevrons give results which are not significantly different from those from classical double sided chevrons within the scatter caused by the material; the apparent fracture toughness can be a function of notch root radius in the chevron test, but not to the same extent as in the single edge notch beam test; there is good agreement between fracture toughness results from the chevron notch beam fracture and the single edge notch beam tests for materials which do not show notch root radius or R curve effects. The specimen displacement rate has a significant effect on most materials. Low toughness values are recorded at slow loading rates because crack propagation rates are slow and subcritical. The test does not therefore record a K(sub IC) for fast growth unless it is performed very quickly.
ESA

N93-31558*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
PROGRESS IN SPECKLE-SHIFT STRAIN MEASUREMENT
Christian T. Lant (Sverdrup Technology, Inc., Brook Park, OH.), John P. Barranger, Lawrence G. Oberle, and Lawrence C. Greer, III *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 39-44 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

N93-31562*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
STRUCTURAL DYNAMICS: PROBABILISTIC STRUCTURAL ANALYSIS METHODS. PROGRAM OVERVIEW
Christos C. Chamis and Dale A. Hopkins *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 65-70 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

N93-31571*# Northwestern Univ., Evanston, IL.
PROBABILISTIC FRACTURE FINITE ELEMENTS
W. K. Liu, T. Belytschko, and Y. J. Lua *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 137-144 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

N93-31575*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
CUMULATIVE FATIGUE DAMAGE BEHAVIOR OF MAR M-247
Michael A. McGaw, Gary R. Halford, and Sreeramesh Kalluri (Sverdrup Technology, Inc., Brook Park, OH.) *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 173-177 (For primary document see N93-31552 12-20)
Avail: CASI HC A01/MF A03

N93-31748# Centre d'Essais Aeronautique Toulouse (France).
CRACK GROWTH PREDICTION RESULTS
Eric Jany, Olivier Renne, and Paul Heuler (Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn, Germany.) *In* AGARD, AGARD Engine Disc Cooperative Test Programme Apr. 1993 83 p (For primary document see N93-31741 12-07)
Copyright Avail: CASI HC A05/MF A03

N93-31749# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (Germany).
CONCLUSIONS AND RECOMMENDATIONS
Paul Heuler, Walter Schuetz, and Eric Jany (Centre d'Essais Aeronautique Toulouse, France.) *In* AGARD, AGARD Engine Disc Cooperative Test Programme Apr. 1993 5 p (For primary document see N93-31741 12-07)
Copyright Avail: CASI HC A01/MF A03

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography.*

N93-31060# New York Univ. Medical Center.
COMPUTING WITH NEURAL MAPS: APPLICATION TO PERCEPTUAL AND COGNITIVE FUNCTION Final Report, 1 Aug. 1988 - 31 Jul. 1992
Eric L. Schwartz 26 Mar. 1993 5 p
(Grant AF-AFOSR-0275-88)
(AD-A264092; AFOSR-93-0315TR) Avail: CASI HC A01/MF A01

In this report, a series of studies concerning the use of neuronal map data structures for the solution of perceptual, attentional, and pattern classification problems have been developed. Models for visual attention, based on the representation of an attentional space as a two dimensional map, have led to a model of visual attention which has been successfully used in the application of a space-variant active vision system, described below. It has been demonstrated that stereo fusion limits, such as Panum's fusional area, scale in a manner which is determined by the size of a cortical hypercolumn, and the local value of cortical magnification factor, supporting a model in which stereo disparity is computed by a local correlational operator defined on the span of a single pair of ocular dominance columns. Methods for numerically modeling conformal topographic cortical maps have led to important insights into the pattern level description of these cortical systems. A prototype space-variant active vision system has been constructed, with funds for hardware support from DARPA, and a number of difficult algorithmic problems in motor control, attention, space-variant image processing, and space-variant pattern classification, have begun to be studied. One book has been published in this project period: Computational Neuroscience, Eric Schwartz, MIT Press (1990) which presented the proceedings of an earlier conference which introduced the term 'Computational Neuroscience' into its current widespread use.
DTIC

N93-31115# Bureau of Mines, Denver, CO. Minerals Availability Field Office.
AVAILABILITY OF PLATINUM AND PLATINUM-GROUP METALS Information Circular, 1993
C. T. Fogg and J. L. Cornellisson 1993 64 p See also PB83-156869 (PB93-189496; BM-IC-9338) Avail: CASI HC A04/MF A01

The Bureau of Mines investigated the availability of platinum, palladium, and rhodium from 16 deposits in four market economy countries. Major recoverable products include 164 Moz of platinum, 80 Moz of palladium, 13 Moz of rhodium, 24 Moz of ruthenium, 4 Moz of Iridium, 2 Moz of Osmium, and 10 Moz of gold. The 12 deposits in the Republic of South Africa are estimated to account for 96.7 pct of total recoverable platinum. The base-case scenario estimates the long-term cost of production including recovery of capital, but provides no return on the investment or 0-pct discounted cash-flow rate of return (DCFROR). The total production costs in January 1990 U.S. dollars ranged from $325/oz to $1,288/oz of platinum compared to an average January 1990 price of $492/oz. Approximately 83 pct of total recoverable platinum was found to be economic at a cost of $450/oz or less. At the 15-pct DCFROR, only 26 pct of total recoverable platinum was economic. For PGM, attention has been focused on the ratios of the three primary metals; platinum, palladium, and rhodium. Sensitivity analyses were performed to determine the impact long-term rhodium price increases could have on the total cost of production for platinum and palladium.
NTIS

N93-31116 Bureau of Mines, Amarillo, TX. Helium Field Operations.
HELIUM RESOURCES OF THE UNITED STATES, 1991 Information Circular, 1993

J. E. Hamak and B. D. Gage 1993 26 p See also PB91-110817 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB93-189652; BM-IC-9342) Avail: CASI HC A03

The identified helium resources of the United States are estimated at 630 Bcf. This includes 295 Bcf of demonstrated reserves, 87 Bcf of demonstrated marginal reserves, and 42 Bcf of demonstrated subeconomic resources. The identified resources include 161 Bcf of helium in inferred reserves and marginal reserves and 45 Bcf in inferred subeconomic resources. The identified helium resources contained on Federal lands are approximately 172 Bcf, including 32 Bcf in underground storage in the Cliffside Gas Field near Amarillo, Texas. In addition to the identified helium resources, undiscovered helium resources in the United States are estimated at a most likely value of 103 Bcf, with a maximum value of 259 Bcf and a minimum value of 41 Bcf. Also reported are 43 Bcf of helium in nonconventional and low helium content natural gases. Current extraction of helium in the United States occurs mostly from the Hugoton gas area in Kansas and Oklahoma and the Riley Ridge area in southwest Wyoming. Helium extracted from natural gas in the United States in 1990 was 2.5 Bcf. NTIS

N93-31187# Lawrence Livermore National Lab., CA.
UNCLASSIFIED SATELLITE REMOTE SENSING AS A COMPONENT OF INTEGRATED TREATY VERIFICATION
A. A. Parziale Oct. 1992 35 p
(Contract W-7405-eng-48)
(DE93-005736; UCRL-ID-110838) Avail: CASI HC A03/MF A01 (US Sales Only)

An assessment of the applicability of unclassified remote-sensing satellites to treaty verification is provided. Particular attention is given to the ability of optical and synthetic aperture radar (SAR) satellites to detect clandestine underground nuclear tests. Application to the associated problems of nuclear proliferation and arms control verification are also addressed. A background review of commercial and scientific remote-sensing satellites is provided, including past and planned satellite launches, capabilities of currently active satellites, and proposed advanced remote-sensing satellite systems. The wide-angle imaging capabilities of commercial satellites, such as the U.S. Landsat, the French Satellite Pour l'Observation de la Terre (SPOT), and the Soviet Almaz SAR, are shown to be capable of detecting major surface disturbances associated with nuclear facility and nuclear test operations. Satellite mean time between target area overpasses and cloud free observations are modeled and estimated for a variety of satellites taken individually and in combination. Finally, recently proposed advanced remote-sensing satellite systems are considered: Brilliant Eyes,and the Motorola Iridium system supplemented with remote sensors. Such advanced systems could provide 24-hour coverage of the Earth's surface and near real-time transmission of images to verification ground stations. However, the data processing requirements associated with worldwide 24-hour coverage would overload current image processing and storage capabilities. DOE

N93-31213# Forest Service, Ogden, UT. Intermountain Research Station.
MONITORING VEGETATION GREENNESS WITH SATELLITE DATA Forest Service General Technical Report
R. E. Burgan and R. A. Hartford May 1993 18 p
(PB93-190882; FSGTR/INT-297) Avail: CASI HC A03/MF A01

Vegetation greenness can be monitored at 1-km resolution for the conterminous United States through data obtained from the Advanced Very High Resolution Radiometer on the NOAA-11 weather satellites. The data are used to calculate biweekly composites of the Normalized Difference Vegetation Index. The resulting composite images are updated weekly and made available to land managers who then calculate and display two measures of percentage vegetation greenness. The images provide a useful method of monitoring the condition of vegetation for fire or range management or other land management functions. NTIS

N93-31256# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
REPORTS ON CARTOGRAPHY AND TOPOGRAPHY, SERIES 1, REPORT NO. 103 [NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN, REIHE 1, HEFT NR. 103]
1989 132 p In GERMAN Presented at the 25th Siteung der Arbeitsgruppe Automation in der Kartographie, Hamburg, Germany, 8-9 Oct. 1988
(ETN-90-97325) Avail: CASI HC A07/MF A02

The following topics are discussed: a European road database; and procedures for processing, estimating, and evaluating graphical and non-graphical information from aeronautical charts and other sources. Autonomous car navigation systems and computer languages and software specifically developed for such use are discussed. An electronic chart display and an information system for navigation of the North Sea is presented. A procedure for automatic acquisition of elevation points is described. A catalog of landscape features is developed. Procedures for estimating the accuracy of a digitizer are presented. Other aspects of remote sensing and mapping are outlined. For individual titles, see N93-31257 through N93-31270.

N93-31257# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
EUROPEAN ROAD DATABASE: ACTIVITIES WITHIN THE ATKIS [EUROPEAN ROAD DATABASE: AKTIVITAETEN INNERHALB DER CERCO]
Klaus Barwinski *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 7-10 In GERMAN (For primary document see N93-31256 12-43)
Avail: CASI HC A01/MF A02

Two topics involved in developing a European road database are discussed. Both topics are part of a project entitled: Authoritative Topographic Cartographic Information System (ATKIS). Possible cooperation between geodetic services and the private sector is discussed. Illustrations of maps and attendant road database charts are presented. Diagrams of the data flow architecture involved in setting up the database are shown. ESA

N93-31258# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
AERIAL CARTOGRAPHY USING SICAD NAV-AIR [AERONAUTISCHE KARTOGRAPHIE MIT SICAD NAV-AIR]
Guenther Cada and Alois Hendges *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 11-25 In GERMAN (For primary document see N93-31256 12-43)
Avail: CASI HC A03/MF A02

The use of the graphical system SICAD (Siemens Computer Aided Design) together with its component NAV-AIR is described. The systems allows for improvement and considerable acceleration of existing procedures for processing, estimating, and evaluating graphical and non-graphical information for aeronautical charts. SICAD NAV-AIR is shown to guarantee the correctness, completeness, and up to date information contained in ratio navigation charts, area charts, and airfield charts. The design complies with an update cycle of 28 days as is required by the air traffic control authority. ESA

N93-31259# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
DIGITAL READING OF ROAD NETWORK DATA IN DEVELOPING A CARTOGRAPHIC INFORMATION SYSTEM [ERFAHRUNGEN MIT DIGITALISIERUNG VON STRASSENDATEN FUER EIN VERKEHRSNAVIGATIONSSYSTEM]
Friedrich Christoffers *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 27-36 In GERMAN (For primary document see N93-31256 12-43)
Avail: CASI HC A02/MF A02

A pilot project for the acquisition of road network data, carried out by the German Topographic and Cadastrial Administration, is described. The data is intended for use in the framework of a vehicle navigation system. The project data sources are described. The procedure followed during data acquisition is outlined. The results obtained are evaluated, and the possibility of keeping the data within the official Topographic Cartographic Information System is discussed. Examples of maps and the digital readings of those maps are shown. ESA

N93-31260# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
GDF: A DIGITIZING FORMAT FOR GEOGRAPHICAL DATA [GDF: EIN AUSTAUSCHFORMAT FUER GEOGRAPHISCHE DATEN]

Hinrich Claussen *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 37-44 In GERMAN (For primary document see N93-31256 12-43)
Avail: CASI HC A02/MF A02

The GDF digitizing format created for the Eureka-Demeter Project is described. The need to acquire digital data according to unique specifications is stressed. The basic precondition for the function of autonomous car navigation systems is the avalability of digital map data on a mass storage medium in the car. A unique exchange format is needed in order to be able to exchange and use digital data. The data may already exist in digital form or is still to be captured from analog source material. The GDF standard seeks to make this digitized material inter-compatible. ESA

N93-31261# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
A QUERY LANGUAGE FOR SPATIAL DATA [EINE ABFRAGESPRACHE FUER RAUMBEZOGENE INFORMATIONEN]
Dirk Findeisen *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 45-56 In GERMAN (For primary document see N93-31256 12-43)
Avail: CASI HC A03/MF A02

A query language for spatial data (SDQL) is described. It is used as a basis for discussion of a query standard oriented towards practical use. The query language is presented in structured form. A combination of menu-oriented dialog systems and formal language is planned. SDQL takes into consideration the object related and hierarchically oriented kind of view of a landscape by a spectator, the spatial relation including the acquisition and description of the topographical relations and the interpretation of object attributes. Connection with a relational technical data base is discussed. ESA

N93-31262# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
AN ELECTRONIC SEA MAP [DIE ELEKTRONISCHE SEEKARTE]
Joerg Geerke *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 57-59 In GERMAN (For primary document see N93-31256 12-43)
Avail: CASI HC A01/MF A02

The Electronic Chart Display and Information System (ECDIS) is described. The North Sea Project 1987-1988 is described. The project allowed the different countries bordering the North Sea to get some practical experience with ECDIS for the first time. The interpretation on Inmarsat enhanced group call system information by ECDIS is described. Use of the system by the International Hydrophysical Organization (IHO) is discussed. Integration of the Map and Chart Data Interchange Format (MACDIF) into the system is outlined. ESA

N93-31263# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
AUTOMATIC ACQUISITION OF ELEVATION POINTS IN MAP-MAKING USING THE TUEK 200 [AUTOMATISCHE ERFASSUNG VON HOEHENPUNKTEN DURCH MUSTERERKENNUNG IM KARTENWERK TUEK 200]
Matthias Giebels *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 61-68 In GERMAN (For primary document see N93-31256 12-43)
Avail: CASI HC A03/MF A02

A procedure for automatic acquisition of elevation points and their heights by pattern recognition developed for the TUK 200 is described. The procedure is based on simple raster operations: thinning, thickening, counting pixels, and determining the number of knots. The 'Quadar' procedure allows a constantly small subdivision of the total quantity of numbers to be classified by the successive addition of further features. A file containing the coordinates of the elevation points and their respective heights is obtained. ESA

N93-31264# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
A CATALOG OF LANDSCAPE FEATURES. A MODELING INSTRUMENT FOR THE ATKIS INFORMATION SYSTEM [DER KATALOG DER LANDSCHAFTSOBJEKTE. EIN MODELLIERUNGSINSTRUMENT FUER DAS INFORMATIONSSYSTEM ATKIS]
Helmut Gran *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 69-78 In GERMAN (For primary document see N93-31256 12-43)
Avail: CASI HC A02/MF A02

The catalog of landscape features used as a modeling instrument for the ATKIS information system is described. Particular prerequisites followed in establishing the catalog are described. The structure of the landscape is described using examples. Computer routines demonstrating simulation operations are presented. Information flow within the ATKIS program is presented from the information and signature catalog to the user. ESA

N93-31265# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
ACCURACY ESTIMATION FOR DIGITIZING [ZUR GENAUIGKEITSUNTERSUCHUNG VON DIGITIZERN] **c61**
Robert Kauper *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 79-90 In GERMAN (For primary document see N93-31256 12-43)
Avail: CASI HC A03/MF A02

A procedure for estimating the accuracy of a digitizer and operator in practice is summarized. The minimum demands of the digitizer are included in the examination. Graphs and diagrams demonstrating real digitizing situations are presented. The use of the technique in estimating the accuracy of coordinate system is studied. ESA

N93-31266# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
GEOGRAPHICAL AND TOPOGRAPHICAL DATA FROM SATELLITE IMAGES USED IN DEVELOPING A DIGITAL ROAD TOPOLOGY DATABASE [NUTZUNG VON GEODAETISCH KORRIGIERTEN SATELLITENBILDERN ALS GRUNDLAGE FUER DIGITALE KARTENBILDDATEN]
Karl-Heinz Roeder *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 91-96 In GERMAN (For primary document see N93-31256 12-43)
Avail: CASI HC A02/MF A02

The appropriate combination of high resolution satellite images with a single homogeneous coordinate system is described. The creation of an accurate digital database from this combination is outlined. Tools proposed for this combination are described. The WGS 84 to be used as a coordiante reference system, the Navstar Global Positioning System, and data processing of SPOT panchromatic images on the PGS Image Mapper are described. The use of the data extracted in creating a European road topology database is discussed. ESA

N93-31267# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
ACCESS AND CONTENT OF THE EDBS TOPOGRAPHIC-CARTOGRAPHIC INFORMATION SYSTEM (ATKIS) [DIE EINHEITLICHE DATENBANKSCHNITTSTELLE (EDBS) ALS SCHNITTSTELLE FUER DAS AMTLICHE TOPOGRAPHISCH-KARTOGRAPHISCHE INFORMATIONSSYSTEM (ATKIS)]
Guenter Rossol *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 97-104 In GERMAN (For primary document see N93-31256 12-43)
Avail: CASI HC A02/MF A02

The basic conception of the ATKIS (Amtlische Topographisch-Kartographische Informationssystem) data model is presented. It is made up of a Digital Landscape Model (DLM) along with a Digital Cartographic Model (DCM) and an ATKIS data base management system. The activities necessary before storage in the ATKIS data base is possible and the activities required for preparation and editing by ATKIS processing components are summarized. Data transfer between the ATKIS data base and ATKIS processing components parts is described. Data transfer to private or public user is outlined. ESA

N93-31268# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
SCRIBO: AN INTERACTIVE GRID-BASE NAME PLACEMENT SYSTEM FOR MAP MAKING [SCRIBO: EIN PROGRAMM ZUR PLAZIERUNG VON SCHRIFTEN]

Monika Sester *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 105-111 In GERMAN (For primary document see N93-31256 12-43)
Avail: CASI HC A02/MF A02

A system for interactive grid-based name placement is presented. SCRIBO combines cartographic needs like placement on optionally inclined straight lines or on circles and variation of size, color, width, inclination and distance of letters, with a comfortable method of interactive correction. Letter placement can be performed either in binary or in continuous tone mode. The choices of type and fonts available are illustrated. Future development of the SCRIBO program is discussed. ESA

N93-31269# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
THE USE OF DIGITAL ROAD DATA BY A NAVIGATION SYSTEM [NUTZUNG DIGITALER STRASSENDATEN FUER KFZ-NAVIGATIONSSYSTEME] **c04**
Joachim Siebold *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 113-120 In GERMAN (For primary document see N93-31256 12-43)
Avail: CASI HC A02/MF A02

The principles of location and route search with vehicle navigation systems are summarized. The Bosch TRAVELPILOT, an autonomous navigation system for motorists is described. Use of digital road network data by means of navigation and direction finding systems is discussed. The EURECA and EC Projects intended to develop an exchange format for digital road data and to build up a European digital road data base are described. ESA

N93-31270# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
A SEARCHING METHOD IN A DECLARATIVE CITY MAP [EIN VERFAHREN ZUR WEGESUCHE IN EINEM DEKLARATIVEN STADTPLAN]
Doris Stebe *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 121-128 In GERMAN (For primary document see N93-31256 12-43)
Avail: CASI HC A02/MF A02

A method for searching a way in a declarative map is described. The Tourist Information System (TIS) is presented as a possible application of the technique. The system offers detailed local information in combination with a path finding algorithm that gives a description of the best way (shortest, fastest) between any given places in the street network. The program is written in a logical programming language (TURBO-PROLOG) on an IBM-compatible PC-AT. ESA

N93-31339 Deutsche Geodaetische Kommission, Munich (Germany).
RADIOINTERFEROMETRIC OBSERVATIONS FOR ESTIMATION OF POLE MOTION BY USING LONG NORTH-SOUTH REFERENCE AXES Ph.D. Thesis - Bonn Univ. [RADIOINTERFEROMETRISCHE BEOBACHTUNGEN ZUR BESTIMMUNG DER POLBEWEGUNG UNTER BENUTZUNG LANGER NORD-SUED-BASISLINIEN]
Axel Nothnagel Frankfurt, Germany Institut fuer Angewandte Geodaesie 1991 91 p In GERMAN
(Ser-C-368; ETN-93-93534) Copyright Avail: Issuing Activity (Institut fuer Angewandte Geodaesie, Richard-Strauss-Allee 11, D-6000 Frankfurt am Main 70, Germany)

A method for displaying both the observations and the horizon limitations of two stations forming a baseline in a unified system is described. This technique serves as a tool for improving the quality of observing schedules and it was used for the scheduling of two sets of measurements employing the Hartebeesthoek Radio Astronomy Observatory (HartRAO) (South Africa) in the framework of the IRIS (International Radio Interferometer Surveying) project. In a series of 6 measurements separated by 5 to 10 days, HartRAO observed together with two stations in the U.S. and one station in Europe for Earth orientation determinations. These measurements had a duration of 24 hours each. In the second series, daily measurement of only 2 to 3 hours duration with a single north-south baseline were performed for polar motion monitoring filling the gaps between the network measurements. Both series were observed in two consecutive years, 1986 and 1987, for periods of about 6 weeks each. In the first year the observing schedules were prepared with a conventional approach while in 1987 the technique of displaying the observations relative to a baseline reference point was used. The analysis of the data showed that the standard deviations of the Earth orientation parameters improved by up to 30 percent by the use of the modified scheduling strategy. ESA

N93-31537# Technische Univ., Eindhoven (Netherlands). Telecommunications Div.
THE MICROWAVE RADIOMETER AS A REMOTE SENSING DEVICE: DESIGN AND APPLICATION Ph.D. Thesis
Peter Jacobus Irene deMaagt 1992 211 p
(ISBN-9-09-005507-X; ETN-93-94050) Copyright Avail: CASI HC A10/MF A03

The development of approaches to the design of microwave radiometer systems is addressed. To offer a greater insight into the design procedures, the complete radiometer system is divided into two subsystems, namely the antenna and the receiver. A design procedure for radiometer antennas is proposed and their theoretical performance is considered in relation to their expected performance in practice. A radiometer temperature stabilization method is presented along with the results of testing it with a breadboard model. The relatively new field of imaging in which microwave radiometry has shown its potential is studied. A fundamental analysis of the spatial and temporal filtering process of the observation instrument and the corresponding deconvolution procedures is included. ESA

N93-31595 Royal Netherlands Meteorological Inst., De Bilt.
A SCINTILLATION EXPERIMENT OVER A FOREST
W. Kohsiek 1992 27 p
(KNMI-WR-92-04; ISBN-9-03-693023-X; ETN-93-93927) Copyright Avail: Issuing Activity (Royal Netherlands Meteorological Inst., P.O. Box 201, 3730 AE De Bilt, Wilhelminalaan 10, Netherlands)

Scintillation measurements were carried out on a path of 1640 m over an inhomogeneous forest in the Netherlands. The exchange coefficient for the vertical transport of air pollutants was assessed. To this purpose, a 36 m high tower was erected in a lot with Douglas fir, with sensors for wind speed, temperature, humidity, fluxes of heat, momentum and water vapor, radiation, etc. The purpose of the scintillometer measurement was to compare area averaged heat fluxes with the tower measurements of the heat flux. From the comparison, a judgement was made of the representativeness of the tower measurements. It was found that the application of the scintillation technique was hampered by two factors: uncertainty regarding the scaling of the dimensionless temperature structure parameter at near neutral atmospheric stability, and secondly, uncertainty regarding the effective height of the optical path over the forest. Because of these limitations, no definite answer on the representativeness of the local measurements could be given. ESA

N93-31611# Royal Signals and Radar Establishment, Malvern (England). Image Processing Research Section.
CODE VECTOR DENSITY IN TOPOGRAPHIC MAPPINGS
Stephen P. Luttrell 6 Aug. 1992 17 p
(RSRE-MEMO-4669; BR313438; ETN-93-94025) Avail: CASI HC A03/MF A01

An informally argued derivation of the properties of topographic vector quantizers in the limit of a large codebook size is presented. In particular, the code vector density is proven to not depend on choice of neighborhood function, provided that the minimum distortion (rather than the nearest neighbor) encoding prescription is used. This result suggests that widespread use of the nearest neighbor prescription in topographic mapping networks is fundamentally misguided. It would be advisable to remember that the nearest neighbor prescription is 'assumed' not 'derived', so its adherents must accept defeat gracefully. ESA

N93-32173 Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
POLAMETRIC PASSIVE REMOTE SENSING OF OCEAN SURFACE Annual Report, 15 Apr. 1992 - 14 Apr. 1993
J. A. Kong 10 Jun. 1993 75 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-92-J-1616)
(AD-A265874) Avail: CASI HC A04

Our work on this project in the past year has concentrated primarily on the phase one goals as outlined in the original proposal. To date, we

have performed an experiment in which the polarimetric thermal emission from a sinusoidal water surface was measured and compared against a theoretical model, performed a study of the polarimetric thermal emission from surfaces randomly rough in one direction, and begun work on a model for predicting the polarimetric thermal emission from surfaces randomly rough in two directions. DTIC

N93-32309# Office of Technology Assessment, Washington, DC.
REMOTELY SENSED DATA FROM SPACE. DISTRIBUTION, PRICING, AND APPLICATIONS: AN OTA BACKGROUND PAPER
Jul. 1992 31 p
(PB93-176964) Avail: CASI HC A03/MF A01

A consensus is emerging within the government that Landsat 7 will be funded and managed by the public sector. While giving greater assurance that Landsat data will continue to be available for scientists and other users of the data, returning Landsat operations to the public sector creates a new set of problems. How the United States chooses to address the issues of pricing and distributing Landsat data will prove important not only for land remote sensing, but also for the immense amount of data that the Federal Government intends to gather about the atmosphere, land, and oceans using NASA's Earth Observing System. The short background paper summarizes the discussion concerning data pricing and distribution from a one-day workshop convened by OTA on 20 May 1992. NTIS

N93-32326 Hawaii Univ., Honolulu.
THE APPLICATION OF REMOTELY SENSED DATA TO STUDIES OF VOLCANISM WITHIN THE GALAPAGOS ISLANDS Ph.D. Thesis
Duncan Crawford Munro 1992 323 p
Avail: Univ. Microfilms Order No. DA9312207

The results of three research projects that examine eruption source vents and their products in order to interpret the structure and internal dynamics of the seven major shield volcanoes that comprise Islas Isabela and Fernandina, the two westernmost Galapagos Islands are presented. Difficult access and a respect for the fragile natural environment of the islands prevent intensive field studies in this region and interpretation of data from orbital satellites and a model of lava transport provide the basic tools with which the volcanoes are studied. Chapter 2 presents the methodology and results of an analysis of SPOT-1 satellite data with a spatial resolution of 10 m, that provide complete coverage of Islas Isabela and Fernandina. The pattern of eruption distribution on the flanks of the volcanoes indicate that the development and orientation of fascicular rift zones varies within the group and also through time on these volcanoes. The presence of intracaldera benches may act to inhibit the occurrence of eruptions on the adjacent segment of the volcano summit plateau. A comparison of the morphology of eruptive products in the Galapagos and Hawaii suggests that the rift zones are inefficient conduits for magma transport and storage. Chapter 3 describes the use of LANDSAT TM data covering Volcan Fernandina to investigate how the character of lava flow surfaces changes with age. These data revealed no systematic variation in the behavior of lava flow surfaces in the visible and near infrared region of the electromagnetic spectrum with age and thus no conclusions regarding the magmatic output of Volcan Fernanadina could be made. The use of a computer model of lava flow transport to investigate the effects of volumetric discharge rate on lava flow planimetric shape is described in chapter 4. This model suggests that observed widths of lava flows in the western Galapagos Islands may be the result of volumetric discharge rates of 5 cu m/sec. The difficulty of duplicating exactly the topography over which flows have traveled hampers the interpretation of the entire planimetric shape in terms of the eruption characteristics. Dissert. Abstr.

N93-32342# Beleidscommissie Remote Sensing, Delft (Netherlands). Meetkundige Dienst.
VEGETATION MAPPING FOR ENVIRONMENT MANAGEMENT AND MONITORING [VEGETATIEKARTERING VOOR NATUURBEHEER EN MILIEUMONITORING]
Roeland Allewijn and P. C. deHullu (Staatsboseheer, Driebergen, Netherlands.) May 1992 4 p In DUTCH
(ETN-93-93466) Avail: CASI HC A01/MF A01

Vegetation mapping based on remote sensing from aircraft or satellites with a view to environment management and monitoring is presented. The vegetation can be an indication for the environmental circumstances in the area. The vegetation changes of the circumstances are changed due to human intervention or natural processes. The comparison of remote sensing pictures taken at different times allows environment monitoring and the determination of the effects of environment management. ESA

N93-32343# Beleidscommissie Remote Sensing, Delft (Netherlands).
SATELLITE PICTURES: AN EFFICIENT AID FOR INFORMATION ABOUT LAND USE [SATELLIETBEELDEN: EFFICIENT HULPMIDDEL VOOR INFORMATIE OVER HET GRONDGEBRUIK]
H. A. M. Thunnissen (Winand Staring Centre, Wageningen, Netherlands.), R. Beck (DHV Raadgevend Ingenieursbureau B.V., Amersfoort, Netherlands.), and C. Visscher (Bureau Landmeetkundige Zaken, 's-Hertogenbosch, Netherlands.) May 1992 4 p In DUTCH
(ETN-93-93467) Avail: CASI HC A01/MF A01

The suitability of satellite pictures to provide actual data on land use is outlined. Possible applications are: environment management, water management, land management, and urban planning. The land use data can be coupled with other geographic information in a Geographic Information System (GIS). LANDSAT satellite pictures are used for the Dutch land use data base. The pictures are produced by registering solar radiation reflected by objects on the Earth's surface. The data base consists of a raster with elements of 25 by 25 m, covering the whole country. Fifteen land use classes are distinguished. ESA

N93-32344# Beleidscommissie Remote Sensing, Delft (Netherlands).
REMOTE SENSING: A POWERFUL AID FOR THE ANALYSIS OF PROBLEMS IN THE NORTH HOLLAND VECHTSTREEK [REMOTE SENSING: EEN KRACHTIG HULPMIDDLE BIJ DE PROBLEEMANALYSE VAN DE NOORDHOLLANDSE VECHSTREEK]
A. G. Dekker (Vrije Univ., Brussels, Belgium.) and P. J. T. Verstraelen (Zuiveringschap Amstel-en Gooiland, Hilversum, Netherlands.) May 1992 4 p In DUTCH
(ETN-93-93468) Avail: CASI HC A01/MF A01

The possibilities of advanced remote sensing techniques in the field of water management are outlined, taking as an example the north Holland wetland 'Vechstreek'. The special natural values of this region are greatly lost due to drying out and eutrophication. Remote sensing studies using aerial pictures determine correlations between data from field work. Remote sensing increases the efficiency of field measurements, reduces the costs, and leads to a better insight. ESA

N93-32345# Beleidscommissie Remote Sensing, Delft (Netherlands).
A NEW VIEW OF THE SEA [EEN NIEUWE KIJK OP DE ZEE]
Jun. 1992 4 p In DUTCH Prepared in cooperation with National Aerospace Lab., Marknesse, Netherlands
(ETN-93-93469) Avail: CASI HC A01/MF A01

The use of LANDSAT satellites for sea observation is described. The ERS-1 satellite is specially aimed at observations of oceans, coastal areas, and polar regions. The ERS-1 provides data from the Active Microwave Instrumentation (AMI) (Synthetic Aperture Radar (SAR), wave scatterometer, wind scatterometer), from the Radar Altimeters (RA's) (wave heights and wind speeds), and from an IR sensor (sea surface temperature). ESA

N93-32362*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
ESTAR: THE ELECTRONICALLY SCANNED THINNED ARRAY RADIOMETER FOR REMOTE SENSING MEASUREMENT OF SOIL MOISTURE AND OCEAN SALINITY
C. T. Swift (National Aeronautics and Space Administration, Washington, DC.) Jul. 1993 42 p
(NASA-TM-4523; NAS 1.15:4523; Rept-93B00074) Avail: CASI HC A03/MF A01

The product of a working group assembled to help define the science objectives and measurement requirements of a spaceborne L-band microwave radiometer devoted to remote sensing of surface soil moisture and sea surface salinity is presented. Remote sensing in this long-wavelength portion of the microwave spectrum requires large antennas in low-Earth orbit to achieve acceptable spatial resolution. The proposed radiometer, ESTAR, is unique in that it employs aperture synthesis to reduce the antenna area requirements for a space system. Author (revised)

N93-32420# Technical Research Centre of Finland, Espoo. Forest Products Lab.
SURFACE ROUGHNESS MEASURING SYSTEMS [PINNANKARHEUDEN MITTAUSMENETELMAET]
Eeva-Liisa Lepistoe-Saukko Aug. 1992 60 p In FINNISH Sponsored by Technical Research Centre of Finland, Espoo
(VTT-TIED-1392; ISBN-9-51-384205-3; ETN-93-94014) Copyright Avail: CASI HC A04/MF A01

A study to investigate available advanced surface roughnesss measuring systems and how they are applied to measuring the surface roughness of wood over the entire roughness range necessary for both research and quality control activities is presented. An examination of traditional inductive measuring based systems and a review of optical noncontact measuring systems are given. Only one optical measuring system suitable for wood surface roughness was found. This system is based on the laser distance technique. A position sensitive photodiode acts as the sensor. Four proposals for system applications were produced from this study: an application of photographic and image processing methods; an application using laser displacement measurement; an application with an optical surface roughness meter; and an application with a paper topography scanner for measuring wood surface roughness. ESA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *28 Propellants and Fuels.*

N93-31070 American Solar Energy Society, Boulder, CO.
THE 1991 SOLAR WORLD CONGRESS: PROCEEDINGS OF THE BIENNIAL CONGRESS OF THE INTERNATIONAL SOLAR ENERGY SOCIETY, VOLUME 2, PART 1
M. E. Arden, ed., Susan M. A. Burley, ed., and Martha Coleman, ed. 1992 640 p Congress held in Denver, CO, 19-23 Aug. 1991 Sponsored by EPA
(PB93-174787; EPA/600/R-93/058C-Vol-2-Pt-1) Copyright Avail: Issuing Activity

Proceedings of the 1991 Solar World Congress, volume 2, part 1 are provided. Topics discussed include solar collectors, solar water heating, and solar cooling systems. Derived from text

N93-31104 American Solar Energy Society, Boulder, CO.
THE 1991 SOLAR WORLD CONGRESS: PROCEEDINGS OF THE BIENNIAL CONGRESS OF THE INTERNATIONAL SOLAR ENERGY SOCIETY, VOLUME 3, PART 1
M. E. Arden, ed., Susan M. A. Burley, ed., and Martha Coleman, ed. 1992 672 p Congress held in Denver, CO, 19-23 Aug. 1991 Sponsored by EPA
(PB93-174803; EPA/600/R-93/058E-Vol-3-Pt-1; ISBN-0-08-041690-X) Copyright Avail: Issuing Activity

Proceedings of the 1991 Solar World Congress, volume 3, part 1 are presented. Topics covered include: solar building design; zero-energy building designs; emerging architecture; vernacular architecture; passive commercial buildings; daylighting; atriums; passive strategies and materials; transparent insulation; convection and mass; comfort; passive cooling; and passive computer analysis. Derived from text

N93-31105 American Solar Energy Society, Boulder, CO.
THE 1991 SOLAR WORLD CONGRESS: PROCEEDINGS OF THE BIENNIAL CONGRESS OF THE INTERNATIONAL SOLAR ENERGY SOCIETY, VOLUME 3, PART 2
M. E. Arden, ed., Susan M. A. Burley, ed., and Martha Coleman, ed. 1992 670 p Congress held in Denver, CO, 19-23 Aug. 1991 Sponsored by EPA
(PB93-174811; EPA/600/R-93/058E-Vol-3-Pt-2; ISBN-0-08-041690-X) Copyright Avail: Issuing Activity

Proceedings of the 1991 Solar World Congress, Volume 3, Part 2 are presented. Topics covered include: passive computer analysis; monitored passive modules; extended passive monitoring; passive non-computer design tools; sustainability; environmental effects; national solar programs; developing country applications; and technology transfer. Derived from text

N93-31811# Agency of Industrial Science and Technology, Tokyo (Japan).
JAPAN'S SUNSHINE PROJECT
Jul. 1992 116 p
(DE93-768309; ETDE/JP-mf-93768309) Avail: CASI HC A06/MF A02 (US Sales Only)

The 1991 results of the Sunshine Project carried out by the Japanese government's MITI is summarized. The outline of the project is given in terms of basic research and development of new energy technology, Sunshine Project promotion/support researches, and international cooperation. As for the basic R and D, research and development of ocean energy, wind energy, and bio-energy are conducted, and the analytical evaluation is made. Concerning the project promotion/support researches, the issue of introduction of new energy such as energy and environment, energy use best mix, etc. was studied. As to the international cooperation, exchanges with international organizations like IEA, participation in international joint projects, and exchange and collection of information are conducted. Details are mainly given to the studies of the ocean thermal energy conversion system, the large wind turbine power generation system, production of hydrocarbon system from CO2 fixation plant, energy conversion by microbial photosynthesis, production of new fuel oil by biotechnology, growth control compounds for biomass, etc. DOE

N93-31812# New Energy and Industrial Technology Development Organization, Tokyo (Japan).
STUDY SURVEY ON A HIGH-EFFICIENCY ENVIRONMENT HARMONY TYPE ENERGY CASCADE UTILIZATION SYSTEM
Mar. 1992 302 p
(DE93-768469; NEDO-P-9108) Avail: CASI HC A14/MF A03 (US Sales Only)

The development trend of the technology necessitated in cascade utilization of energy in the regional scale is studied in terms of degree of its feasibility, development effects, etc. The technology for regional cascade utilization of energy has a system in which energy is recovered from various waste heat sources and unused energy sources, and the energy is stored and transported to the place of demand as the need arises. At the place of demand, the energy transported is converted in the forms suitable for utilizations to meet the demand. This technology includes heat recovery technology, heat transport/heat storage technology, and heat utilization technology, and what supports the base of these technologies is common base support technology, environmental load reduction technology, and energy systematizing technology. For materialization of the system, it is indispensable to develop technologies such as recovery/utilization of unused energy, matching of energy supply/demand, efficiency of the energy utilization system, and consideration of the environment, as well as to solve the problems such as supply responsibility, cost, pipe installation for waste heat transport, and city planning. DOE

N93-32038# New Energy and Industrial Technology Development Organization, Tokyo (Japan).
ELEVENTH ANNUAL CONFERENCE ON ENERGY CONSERVATION AND STORAGE TECHNOLOGIES
Oct. 1991 103 p
(DE93-768429; NEDO-OS-9105) Avail: CASI HC A06/MF A02

A compilation of reports presented by NEDO and NEDO-commissioned companies as the Eleventh Annual Conference on Energy Conversion and Storage Technologies are presented. It contains an overview of energy conversion and storage technology development projects and progress reports of the projects. Outline of operations, achievements in fiscal 1990, and plans for fiscal 1991 of the projects are overviewed. For the development of techniques for fuel cell power generation, present situation of research and development of solid oxide fuel cells and molten carbonate fuel cell power generation system and achievements of the 200-kW class phosphoric acid fuel cell project are presented. For the development of an advanced battery electric energy storage system, operational studies of a 1,000-kW class zinc-bromine pilot system are described. In addition, the development of a super heat pump energy accumulation system for both high and low temperature operation, development of superconducting technology for

application to electric power generation, and research and development of heat-resistant ceramic materials for 300-kW class ceramic gas turbines for cogeneration are presented. DOE

N93-32041# Agency of Industrial Science and Technology, Tokyo (Japan).
JAPAN'S SUNSHINE PROJECT
Jul. 1992 48 p
(DE93-768157; ETDE/JP-mf-93768157) Avail: CASI HC A03/MF A01

A summary report is given on the results of hydrogen energy research and development achieved during 1991 under the Sunshine Project. In hydrogen manufacturing, regenerative cells that can also generate power as fuel cells were discussed by using solid macromolecular electrolytic films for the case where no electrolysis is carried out with water electrolysis. Yttria stabilized zirconia (YSZ), an oxide solid electrolyte was used for the basic research on high-temperature steam electrolysis. Compositions of hydrogen storage alloys and their deterioration mechanisms were investigated to develop hydrogen transportation and storage technologies. High-density hydrides were searched, and fluidization due to paraffin was discussed. Electrode materials and forming technologies were discussed to develop a hydrogen to power conversion system using hydrogen storage alloys as reversible electrodes. Hydrogen-oxygen combustion was studied in terms of reactive theories, and so was the control of ignition and combustion using ultraviolet ray ignition plasma. Studies were made on hydrogen brittlement in welds on materials in hydrogen utilization and its preventive measures. Surveys were given on technical movements and development problems in high-efficiency, pollution-free hydrogen combustion turbines. DOE

N93-32042# Agency of Industrial Science and Technology, Tokyo (Japan).
JAPAN'S SUNSHINE PROJECT
Jul. 1992 48 p
(DE93-768166; ETDE/JP-mf-93768166) Avail: CASI HC A03/MF A01

A summary report is given on the results of hydrogen energy research and development achieved during 1991 under the Sunshine Project. In hydrogen manufacturing, regenerative cells that can also generate power as fuel cells were discussed by using solid macromolecular electrolytic films for the case where no electrolysis is carried out with water electrolysis. Yttria stabilized zirconia (YSZ), an oxide solid electrolyte was used for the basic research on high-temperature steam electrolysis. Compositions of hydrogen storage alloys and their deterioration mechanisms were investigated to develop hydrogen transportation and storage technologies. High-density hydrides were searched, and fluidization due to paraffin was discussed. Electrode materials and forming technologies were discussed to develop a hydrogen to power conversion system using hydrogen storage alloys as reversible electrodes. Hydrogen-oxygen combustion was studied in terms of reactive theories, and so was the control of ignition and combustion using ultraviolet ray ignition plasma. Studies were made on hydrogen brittlement in welds on materials in hydrogen utilization and its preventive measures. Surveys were given on technical movements and development problems in high-efficiency, pollution-free hydrogen combustion turbines. DOE

N93-32053# Agency of Industrial Science and Technology, Tokyo (Japan).
JAPAN'S SUNSHINE PROJECT
Jul. 1992 126 p
(DE93-768249; ETDE/JP-mf-93768249) Avail: CASI HC A07/MF A02

A report summary of the results obtained on geothermal energies in the Sunshine Project during the fiscal year 1991 is presented. The report items include the following: studies on technologies to explore great-depth geothermal energy resources and technologies to evaluate nationwide geothermal energy resources; studies on geothermal well drilling technologies; studies on developing geothermally usable materials; studies on technologies to extract fracture heat from high-temperature rocks; studies on 0 technologies to utilize completely geothermally hot water; comprehensive surveys on nationwide geothermal energy resources; analyses and evaluations on methods to explore fracture type reservoir beds; development of binary cycle power generation plants (developments of 10-MW class plants; down hole pumps; technologies to increase minable resources; technologies to prevent water leakage from geothermal wells and systems to detect shaft-bottom information during geothermal well drilling); development of elementary technologies for hot rock power generation; analyses and evaluations on systems to extract heat from hot rocks; and analyses and evaluations on data associated with developing technologies to increase minable resources. DOE

N93-32054# Agency of Industrial Science and Technology, Tokyo (Japan).
JAPAN'S SUNSHINE PROJECT
Jul. 1992 135 p
(DE93-768268; ETDE/JP-mf-93768268) Avail: CASI HC A07/MF A02

A report summary of the results obtained on geothermal energies in the Sunshine Project during the fiscal year 1991 are presented. The report items include the following: studies on technologies to explore great-depth geothermal energy resources and technologies to evaluate nationwide geothermal energy resources; studies on geothermal well drilling technologies; studies on developing geothermally usable materials; studies on technologies to extract fracture heat from high-temperature rocks; studies on technologies to utilize completely geothermally hot water; comprehensive surveys on nationwide geothermal energy resources; analyses and evaluations on methods to explore fracture type reservoir beds; development of binary cycle power generation plants (developments of 10-MW class plants); down hole pumps; technologies to increase minable resources; technologies to prevent water leakage from geothermal wells; and systems to detect shaft-bottom information during geothermal well drilling); development of elementary technologies for hot rock power generation; analyses and evaluations on systems to extract heat from hot rocks; and analyses and evaluations on data associated with developing technologies to increase minable resources. DOE

N93-32056# New Energy and Industrial Technology Development Organization, Tokyo (Japan).
SESSION OF ALCOHOL AND BIOMASS ENERGY TECHNOLOGY
Sep. 1992 52 p
(DE93-768440; ETDE/JP-mf-93768440) Avail: CASI HC A04/MF A01

A situation and achievements of New Energy and Industrial Technology Development Organization's (NEDO's) development of alcohol biomass technology are presented. The following topics are addressed: a general situation of development of alcohol biomass technology; development of a methane gas manufacturing system using waste; focusing the physico-chemical decomposition; development of high efficiency waste power generation technology; development of corrosion-resistant superheater; demonstration tests of methanol conversion in oil-burning plants; development and research of a methanol engine system for power generation; demonstration tests of methanol conversion in oil-burning plants; and demonstration tests of a reformed methanol total power generation system (system designing and its evaluation). Results up to FY 1991 and research and development plans in FY 1992 of these development projects of alcohol biomass technology are illustrated. DOE

N93-32057# New Energy and Industrial Technology Development Organization, Tokyo (Japan).
STUDY ON NEW BIOMASS ENERGY SYSTEMS
Mar. 1992 118 p
(DE93-768470; NEDO-P-9110) Avail: CASI HC A06/MF A02

A biomass energy total system is proposed, and its feasibility is studied. It is the system in which liquid fuel is produced from eucalyptuses planted in the desert area in Australia for production of biomass resource. Eucalyptus tree planting aims at a growth amount of 40 cu m/ha. per year and a practical application area of 45,000ha. CO2 fixation in the biomass plantation becomes 540,000 tons at a 12 ton/ha. rate. Assuming that 0.55 ton of liquid fuel is produced from 1 ton of biomass, a petrochemical plant having a production of 2.5 million bbl/year per unit (equivalent to the fuel used in the 100,000kW class power plant) is needed. Moreover, survey is made on practicality of diesel substitution fuel by esterification of palm oil, and a marked effect of reduction in soot/smoke and particulates in exhaust gas is confirmed. The biomass conversion process technology and the technology for afforestation at the arid land and irrigation are important as future subjects, and the technology development using a bench plant and a pilot plant is needed. DOE

N93-32058# New Energy and Industrial Technology Development Organization, Tokyo (Japan).
FEASIBILITY STUDY ON INTRODUCTION OF PETROLEUM SUBSTITUTING ENERGY FOR TRANSPORTATION
Mar. 1992 130 p
(DE93-768472; NEDO-P-9121) Avail: CASI HC A07/MF A02

Concerning electric cars, methanol cars, and CNG (Compressed Natural Gas) cars, the status of development of each of them is studied, grasps the problems on their wide spread through hearings to users, and makes an estimate of the number of cars which is the target for the spread for the time being on the condition that their performance is on the present level. The development of more efficient electric batteries and motors is anticipated for electric cars. Methanol cars have a problem on traveling performance that travel distance by one battery charge is not more than about (1/2) of the existing cars, as well as technical problems such as the development of diesel type use engines, durability of parts, etc. CNG cars have a problem on travel distance by one battery charge which is not more than about (1/3) of the existing cars and a problem on the space caused by carrying the fuel bomb. The target number of fuel substitution cars for the spread is estimated at 833,000 cars, 14% of all the cars in Japan. As of 1991, the number of fuel substitution cars introduced is about 1,200 cars only. In order to lessen the gap, it is indispensable to prepare the infrastructure, improve performance and reliability of the cars, and reduce the cost. DOE

N93-32177# Midwest Research Inst., Golden, CO. National Renewable Energy Lab.
LARGE-AREA, TRIPLE-JUNCTION a-Si ALLOY PRODUCTION SCALE-UP
R. Oswald and J. ODowd Apr. 1993 37 p
(Contract DE-AC02-83CH-10093)
(DE93-010007; NREL/TP-411-5454) Avail: CASI HC A03/MF A01

This report describes Solarex's work to advance its photovoltaic manufacturing technologies, reduce its a-Si:H module production costs, increase module performance, and expand the Solarex commercial production capacity. Solarex will meet these objectives by improving the deposition and quality of the transport front contact; optimizing the laser patterning process; scaling up the semiconductor deposition process; improving the back-contact deposition; and scaling up and improving the encapsulation and testing of its a-Si:H modules. In the Phase 1 portion of this subcontract, Solarex focused on scaling up components of the chemical vapor deposition system for deposition of the system contact; scaling up laser scribing techniques; triple-junction recipes for module production; and metal-oxide back contacts. The goal of these efforts is to adopt all portions of the manufacturing line to handle substrates larger than 0.37 sq m. DOE

N93-32201*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
NON-DESTRUCTIVE, ULTRA-LOW RESISTANCE, THERMALLY STABLE CONTACTS FOR USE ON SHALLOW JUNCTION InP SOLAR CELLS
V. G. Weizer, N. S. Fatemi (Sverdrup Technology, Inc., Arnold AFS, TN.), and A. L. Korenyi-Both (Calspan Corp., Cleveland, OH.) May 1993 6 p Presented at the 23rd IEEE Photovoltaic Specialists Conference, Louisville, KY, 10-14 May 1993; sponsored by IEEE
(RTOP 506-41-11)
(NASA-TM-106228; E-7946; NAS 1.15:106228) Avail: CASI HC A02/MF A01

Contact formation to InP is plagued by violent metal-semiconductor intermixing that takes place during the contact sintering process. Because of this the InP solar cell cannot be sintered after contact deposition. This results in cell contact resistances that are orders of magnitude higher than those that could be achieved if sintering could be performed in a non-destructive manner. We report here on a truly unique contact system involving Au and Ge, which is easily fabricated, which exhibits extremely low values of contact resistivity, and in which there is virtually no metal-semiconductor interdiffusion, even after extended sintering. We present a description of this contact system and suggest possible mechanisms to explain the observed behavior. Author (revised)

N93-32281# Oak Ridge National Lab., TN.
INTERNATIONAL ENERGY AGENCY'S HEAT PUMP CENTRE (IEA-HPC) ANNUAL NATIONAL TEAM WORKING GROUP MEETING
M. A. Broders 30 Sep. 1992 7 p Meeting held in Broders, MA, 30 Sep. 1991
(Contract DE-AC05-84OR-21400)
(DE93-009932; ORNL/FTR-4405) Avail: CASI HC A02/MF A01 (US Sales Only)

The traveler, serving as Delegate from the United States Advanced Heat Pump National Team, participated in the activities of the fourth IEA-HPC National Team Working Group meeting. Highlights of this meeting included review and discussion of 1992 IEA-HPC activities and accomplishments, introduction of the Switzerland National Team, and development of the 1993 IEA-HPC work program. The traveler also gave a formal presentation about the Development and Activities of the IEA Advanced Heat Pump U.S. National Team. DOE

N93-32282# Midwest Research Inst., Golden, CO. National Renewable Energy Lab.
INTERNATIONAL ENERGY AGENCY SOLAR HEATING AND COOLING PROGRAM
A. J. Brooks 1993 6 p
(Contract DE-AC02-83CH-10093)
(DE93-010175; DOE/FTR-93010175) Avail: CASI HC A02/MF A01 (US Sales Only)

This trip was undertaken to participate in and represent the United States Industry at the International Energy Agency (IEA) Solar Heating and Cooling Program (SHCP) Task 14 Workshop. The meeting took place at the A1 Bani Hotel in Rome Italy. DOE

N93-32417# Massachusetts Univ., Gloucester. Dept. of Chemistry.
PHOTOCONDUCTIVITY AND PHOTOVOLTAGE GENERATION IN NOVEL PHOTOCROSSLINKABLE NONLINEAR OPTICAL POLYMERS
Technical Report, 1 Jun. 1992 - 31 May 1993
L. Li, R. J. Jeng, M. Kamath, J. Kumar, and S. K. Tripathy 31 May 1993 5 p
(Contract N00014-90-J-1148)
(AD-A265780) Avail: CASI HC A01/MF A01

Photoconductivity in photocrosslinkable second order nonlinear optical (NLO) polymeric materials and photovoltage generation in a poled guest-host polymer are reported. These NLO polymers have been functionalized with crosslinkable cinnamoyl groups and show relatively stable second order optical nonlinearities at room temperature when poled and crosslinked. Without introducing any photosensitizer or charge carrier transport agents, photoconductivity was obtained in these polymer systems. Optical excitation of the NLO chromophores lead to photocarrier generation, and it is conjectured that these NLO chromophores also play a role in the carrier transport. In addition to photoconductivity, photovoltage generation was observed in the dye doped polymer upon poling. This poled polymer also exhibits a polarization dependent photovoltage when illuminated by light in the absorption region of the NLO chromophore. DTIC

45 ENVIRONMENT POLLUTION

Includes atmospheric, noise, thermal, and water pollution.

N93-31092# World Meteorological Organization, Geneva (Switzerland).
GLOBAL CHANGES AND THE AIR-SEA EXCHANGE OF CHEMICALS
1991 71 p
(DE93-605636; GESAMP-48) Avail: CASI HC A04/MF A01 (US Sales Only)

Changes to the global environment have implications for marine pollution and for air-sea exchange of both anthropogenic and natural substances. This report addresses three issues related to the potential impact of global change on the air-sea exchange of chemicals: global change and air-sea transfer of nutrients nitrogen and iron; global change and air-sea exchange of gases; and oceanic responses to radiative and oxidative changes in atmosphere. Deposition of atmospheric anthropogenic nitrogen has probably increased bio-productivity in coastal regions along continental margins. Atmospheric deposition of new nitrogen may also have increased productivity somewhat in mid-ocean regions. Projected future increases of N-oxide

emissions from Asia, Africa, and South America will increase the rate of deposition of oxidized nitrogen to central North Pacific, equatorial Atlantic, and equatorial and central South Indian Oceans. Atmospheric iron may be an important nutrient in certain open regions. Future changes will likely occur from changed aridity and wind speed as a result of climate change. The most important future effects on surface ocean p(sub CO2) will likely be caused by changes in ocean circulation. The pH of ocean would decrease by (approx)0.3 units for a doubling of p(sub CO2), reducing the capacity of the ocean to take up CO2. There is evidence that dimethyl sulfide from ocean is a source of cloud condensation nuclei and thus a factor controlling cloud albedo. By 2060 in the Southern Hemisphere reduction in total column stratospheric ozone from recent levels could reach 2 to 5% in the tropics, 10% at mid latitudes, and over 20% at 60 deg S. Increases in ground-level effective UV-B radiation could also reach 5%, 26% and 66%, at low, mid, and high latitudes in Southern Hemisphere. Changes in photochemical processes in the surface waters of the ocean could also happen. DOE

N93-31113 Florida Sea Grant Coll., Gainesville.
FLORIDA'S ESTUARIES: A CITIZEN'S GUIDE TO COASTAL LIVING AND CONSERVATION
J. Humphreys, S. Franz, B. Seaman, and J. Potter Mar. 1993 32 p Sponsored by Florida Dept. of Community Affairs Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB93-189330; SGEB-23) Avail: CASI HC A03

The vast network of coastal waters and wetlands that form Florida's estuaries provides major economic benefits to residents of the state. Not only do estuaries support commercial and recreational fisheries, they are also the setting for some of Florida's most popular tourist attractions. As Floridians approach the 21st Century, they are seeking ways to balance conservation with the continued demand for urban expansion. It is the authors hope that the booklet will provide concerned citizens with a starting point for taking a more active role in safeguarding the health of the estuaries. NTIS

N93-31142# Gas Research Inst., Chicago, IL.
ENVIRONMENT AND SAFETY RESEARCH Status Report, 1993
Mar. 1993 82 p See also PB91-210633
(PB93-188860; GRI-93/0089) Avail: CASI HC A05/MF A01

The 1993 status report discusses ongoing and planned research activities in the GRI Environment and Safety Program. The objectives and goals, accomplishments, and strategy along with the basis for each project area are presented for the supply, end use, and gas operations subprograms. Within the context of these subprograms, contract status summaries under their conceptual titles are given for the following project areas: Gas Supply Environmental and Safety Research, Air Quality Research, End Use Equipment Safety Research, Gas Operations Safety Research, Liquefied Natural Gas Safety Research, and Gas Operations Environmental Research. NTIS

N93-31203# Stevens Inst. of Tech., Hoboken, NJ.
THREE-DIMENSIONAL MODELING OF POLLUTANT TRANSPORT IN SURFACE WATERS Final Report
M. S. Bruno Nov. 1992 104 p
(Contract DI-14-08-0001-G1914)
(PB93-190627) Avail: CASI HC A06/MF A02

The assessment of possible impacts of water-borne pollutants in surface water bodies and/or the development of remedial solutions to water quality degradation require the detailed simulation of the eventual fate of contaminants based on mathematical modeling techniques. The development of such a technique would provide a powerful tool to engineers and scientists concerned with the assessment of the long-term consequences of historical disposal patterns or the short-term consequences of a catastrophic event. Using the time dependent velocity fields furnished by a separate hydrodynamic model or a physical model, a transport model solves the advection diffusion equation to simulate the effects of differential advection and turbulent diffusion on a concentration field. An Eulerian-Lagrangian algorithm, based on operator-splitting techniques has been formulated for the three-dimensional advection-diffusion equation. This combines the advantage of a fixed Eulerian grid and computationally powerful Lagrangian technique. NTIS

N93-31212# New Mexico Inst. of Mining and Technology, Socorro. Dept. of Chemistry.
AIR QUALITY STUDIES IN ALBUQUERQUE, NEW MEXICO Technical Completion Report
C. J. Popp Mar. 1993 66 p Sponsored by Geological Survey
(PB93-190817) Avail: CASI HC A04/MF A01

The objectives of the project were to upgrade instrumentation by analyzing species present in the atmosphere, train students in the area of air quality analysis parameters and provide an opportunity to determine baseline atmospheric concentrations of potential pollutants in the urban atmosphere of Albuquerque, New Mexico. A suite of inorganic and organic chemicals were analyzed over a one year period in Albuquerque, New Mexico to determine baseline conditions. Concentrations of low molecular weight carbonyl compounds are relatively high compared with highly polluted areas such as Los Angeles. In addition, ratios of peroxypropionyl nitrate to peroxyacytylnitrate are higher than expected and may be related to the use of oxygenated fuels which are used to mitigate CO concentrations. NTIS

N93-31330 International Bank for Reconstruction and Development, Washington, DC.
TOWARDS A SUSTAINABLE URBAN ENVIRONMENT: THE RIO DE JANEIRO STUDY World Bank Discussion Papers
A. Kreimer 1993 178 p See also PB92-208735
(PB93-187557; World Bank DP-195; ISBN-0-8213-2388-1) Copyright Avail: Issuing Activity

Contents: Rio de Janeiro--In Search of Sustainability; Rio de Janeiro--Natural Beauty as a Public Good; Coastal Zone Management in the Metropolitan Area of Rio de Janeiro; Institutional Framework of Environmental Policy in Brazil; Historical Perspective on the Institutional Framework for Urban Policy; Government Expenditures and Financing on the Environment in Brazil and Rio de Janeiro; Summary of Recent Research on Urban-Environmental Issues; The Rio Reconstruction Project--The First Two Years; Rio and the World Bank--The Start of a Productive Relationship; Appropriate Technologies for Urban Services--Metropolitan Region of Rio de Janeiro. NTIS

N93-31432 Naval Civil Engineering Lab., Port Hueneme, CA.
CHEMICAL DEHALOGENATION TREATMENT: BASE-CATALYZED DECOMPOSITION PROCESS (BCDP)
Jul. 1992 7 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB93-182939) Avail: CASI HC A02

The Base-Catalyzed Decomposition Process (BCDP) is an efficient, relatively inexpensive treatment process for polychlorinated biphenyls (PCB's). It is also effective on other halogenated contaminants such as insecticides, herbicides, pentachlorophenol (PCP), lindane, and chlorinated dibenzodioxins and furans. The heart of BCDP is the rotary reactor in which most of the decomposition takes place. The contaminated soil is first screened, processed with a crusher and pug mill, and stockpiled. Next, in the main treatment step, this stockpile is mixed with sodium bicarbonate (in the amount of 10% of the weight of the stockpile) and heated for about one hour at 630 F in the rotary reactor. Most (about 60% to 90%) of the PCB's in the soil are decomposed in this step. The remainder are volatilized, captured, and decomposed. NTIS

N93-31816# Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
TWO NEW GAS STANDARDS PROGRAMS AT THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
W. J. Mitchell and W. E. May Apr. 1993 8 p See also PB82-162876 Sponsored by National Inst. of Standards and Technology
(PB93-191427; EPA/600/A-93/107) Avail: CASI HC A02/MF A01

The EPA/NIST Certified Reference Materials (CRM) program is being terminated and replaced with two new ones: the NIST Traceable Reference Materials (NTRM) and the Research Gas Mixture (RGM) programs. These new programs are being implemented to provide NIST traceability to a wider number of gas mixtures. The NTRM program will differ from the CRM program in two significant ways: Candidate gas mixtures will not have to be identical to a NIST Standard Reference Material (SRM), and the producer of the NTRM rather than EPA will pay NIST to check the concentration of the gas mixture. In the RGM program, NIST will enter

into agreements with either governmental, commercial or private organizations to produce gas mixtures for which there are no SRMs or which lie outside the concentration range of existing SRMs. The details of these programs are presented in the paper. NTIS

N93-31818# Environmental Protection Agency, Washington, DC. Office of Solid Waste and Emergency Response.
ONLINE GUIDED TOUR OF THE CLEANUP INFORMATION BULLETIN BOARD SYSTEM. (CLU-IN: CLEANUP INFORMATION BULLETIN BOARD)
Feb. 1993 26 p
(PB93-193704; EPA/542/B-93/001) Avail: CASI HC A03/MF A01

The document serves as a guided tour of the Cleanup Information Bulletin Board System (CLU-IN BBS). The purpose of the tour is to make a user's first session online a successful one, even if they have no previous experience on other bulletin board systems (BBSs). The guided tour will walk them through using each of the main features of CLU-IN, including: Log onto the system; Read messages; Send messages; Use the online help; Read bulletins; Download a file; Upload a file; Join a special interest group (SIG); and Exit the system. NTIS

N93-31829 Geological Survey, Reston, VA. Water Resources Div.
EFFECTS OF LOW-LEVEL RADIOACTIVE-WASTE DISPOSAL ON WATER CHEMISTRY IN THE UNSATURATED ZONE AT A SITE NEAR SHEFFIELD, ILLINOIS, 1982-1984
C. A. Peters, R. G. Striegl, P. C. Mills, and R. W. Healy 1993 82 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB93-183051; Water-Supply-Paper-2390) Avail: CASI HC A05

The report details the changes in the chemistry of pore water as it infiltrates areas undisturbed and disturbed by waste-disposal operations. The report (1) describes the techniques used to obtain representative samples of geologic materials and water from the unsaturated zone; (2) describes the chemistry of geologic materials and water in the unsaturated and saturated zones at off-site and on-site locations; and (3) infers, by statistical analysis and use of geochemical models, the geochemical reactions that occur naturally in the unsaturated zone and the effects of low-level radioactive-waste disposal on pore-water chemistry. NTIS

N93-31831 National Oceanic and Atmospheric Administration, Boulder, CO. Aerosol Research Section.
INVESTIGATION OF ATMOSPHERIC AEROSOLS AND GASES AT AN EAST CHINA STATION
F. Parungo, C. Nagamoto, B. Kopcewicz, X. Li (Chinese Academy of Meteorological Sciences, Beijing.), and D. Yang (Chinese Academy of Meteorological Sciences, Beijing.) Apr. 1993 46 p Prepared for National Oceanic and Atmospheric Administration, Silver Spring, MD Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB93-184539; NOAA-TM-ERL-ARL-201) Avail: Issuing Activity (National Technical Information Service (NTIS))

From August to October of 1991, when the West Pacific Exploratory Mission (PEM-west) airborne expedition was conducted, ground-level measurements of gases and aerosols were carried out at Lin-an station near the east coast of China. Meteorological parameters such as temperature, pressure, humidity, solar radiation, wind direction, and wind speed were recorded continuously. Concentrations of SO2, NO2, O3, and black carbon were monitored in situ intermittently. Aerosol samples were collected and later analyzed in laboratories. A transmission electron microscope was used to analyze particle concentration, morphology, and size distribution. Elemental compositions of aerosol samples, collected on filters, were determined with a neutron activation analyzer and with a proton induced x-ray energy spectrometer. The water soluble portions of the aerosols were analyzed by ion chromatography. NTIS

N93-31853# Technical Research Centre of Finland, Espoo. Chemical Lab.
BIOLOGICAL TREATMENT OF POROUS OFF-GASES [HAJUKAASUJEN BIOLOGINEN KAESITTELY]
Jukka Lehtomaeki, Mona Toerroenen, and Anja Laukkarinen Sep. 1992 47 p In FINNISH
(VTT-JULK-766; ISBN-9-51-384114-6; ETN-93-94019) Copyright Avail: CASI HC A03/MF A01

To introduce biological waste air purification to the domestic market and investigate its feasibility in cold climate, an off-gas treatment plant in pilot scale was built. The plant consists of three biofilters with different organic filling materials and two bioscrubbers operating either in series or separately. The organic load and the reduction of organic compounds of each biofilter and bioscrubber are measured continuously with a total hydrocarbon analyzer. The odor reduction rates of the filters and scrubbers are evaluated by sensory analysis with an olfactometer. The applicability of biological waste air purification was tested at a mineral tool factory, a vegetable oil factory, and an animal feed factory. The results indicated that biological waste air purification is very applicable for dilute odorous off-gases with rather low organic load. High dust or resin content of the off-gases can however cause clogging problems. Occasional temperature drops seem to have only a delaying effect on the microbes; short cold periods are not fatal. ESA

N93-31877# Environmental Protection Agency, Washington, DC. Office of Solid Waste and Emergency Response.
RCRA IMPLEMENTATION PLAN, FY 1993 Final Report
Apr. 1992 98 p See also PB91-211813
(PB93-176956; EPA/530/R-92/017; OSWER-DIRECTIVE-9420.00-08)
Avail: CASI HC A05/MF A02

The FY-93 RCRA Implementation Plan defines national priority activities for the RCRA Subtitle C hazardous waste program, the RCRA compliance monitoring and enforcement program, and the RCRA Subtitle D municipal and industrial solid waste program. The plan continues the strategic management framework begun by EPA and the states in FY-92. The report includes facility priority setting and evaluation, permitting, corrective action, states as primary implementors of the RCRA program, waste minimization, biennial reporting system, capacity assurance plans, comprehensive state ground-water planning, compliance monitoring and enforcement, accountability, and municipal and industrial solid waste management. NTIS

N93-31925 Gesellschaft fuer Strahlenforschung m.b.H., Munich (Germany). Projekt Information Umwelt.
AIR TRAFFIC AND ENVIRONMENT [FLUGVERKEHR UND UMWELT]
H.-J. Haury, U. Koller, and G. Assmann Nov. 1991 52 p In GERMAN Journalistenseminar der Information Umwelt held in Neuherberg, Germany, Nov. 1991
(GSF-Band-8; ETN-93-93532) Copyright Avail: Issuing Activity (Fachinformationszentrum Karlsruhe, 7514 Eggenstein-Leopoldshafen 2, Germany)

The following topics are included: climatic effects of harmful emissions from high altitude air traffic; climatic effects of turbofan emissions in the stratosphere; radiation exposure in commercial aircraft; effects on health of noise disturbance during commercial flight; ecological balance by Swissair: waste management as an example; effects of pollution due to commercial flights on the human health and effects of air traffic on nature and environment in the neighborhood of airports, with the example of the Munich2 airport. For individual titles, see N93-31926 through N93-31932.

N93-31926 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (Germany). Inst. fuer Physik der Atmosphaere.
CLIMATIC EFFECTS OF HARMFUL EMISSIONS FROM HIGH ALTITUDE AIR TRAFFIC [KLIMATISCHE AUSWIRKUNGEN VON SCHADSTOFFEMISSIONEN DES HOCHFLIEGENDEN LUFTVERKEHRS]
Ulrich Schumann *In* Gesellschaft fuer Strahlenforschung m.b.H., Air Traffic and Environment Nov. 1991 p 5-10 In GERMAN (For primary document see N93-31925 12-45)
Copyright Avail: Issuing Activity (Fachinformationszentrum Karlsruhe, 7514 Eggenstein-Leopoldshafen 2, Germany)

Effects of carbon, nitrogen, and sulfur oxides, unburnt hydrocarbons, and water vapor on troposphere and stratosphere equilibrium, with particular consideration of mass fluxes between tropopause, troposphere, and stratosphere are described. Results from air chemistry two dimensional model calculations and from satellite data and Lidar measurements are given to estimate emission increase during the last ten years and to quantify the consecutive temperature rise at ground proximity. It is concluded

that high flying air traffic modifies the Earth atmosphere composition causing ice cloud formation. ESA

N93-31927 Ludwig-Maximilians-Univ., Munich (Germany). Lehrstuhl fuer Bioklimatologie und Angewandte Meteorologie.
CLIMATIC EFFECTS OF TURBOFAN EMISSIONS IN THE STRATOSPHERE AND THE HIGHER TROPOSPHERE [KLIMATISCHE AUSWIRKUNGEN VON TRIEBWERKSEMISSIONEN IN DER OBEREN TROPOSPHAERE UND IN DER STRATOSPHAERE]
Peter Fabian *In* Gesellschaft fuer Strahlenforschung m.b.H., Air Traffic and Environment Nov. 1991 p 11-14 In GERMAN (For primary document see N93-31925 12-45)
Copyright Avail: Issuing Activity (Fachinformationszentrum Karlsruhe, 7514 Eggenstein-Leopoldshafen 2, Germany)

Aircraft emission influence is estimated in order to characterize the effects of nitrogen oxides, taking into account that they can be accumulated over the months in the tropopause. Combustion products were identified and their increase with air traffic extension was calculated. Emission distribution in the atmosphere is noticed to be not very well ascertained and models with coupling of photochemical reactions must be achieved in order to obtain good predictions of future aircraft emissions. ESA

N93-31928 Gesellschaft fuer Strahlenforschung m.b.H., Munich (Germany). Inst. fuer Strahlenschutz.
RADIATION EXPOSURE IN AIRCRAFT [STRAHLENBELASTUNG IN FLUGZEUGEN]
H. G. Paretzke and W. Heinrich (Siegen Univ.,, Germany.) *In its* Air Traffic and Environment Nov. 1991 p 15-23 In GERMAN (For primary document see N93-31925 12-45)
Copyright Avail: Issuing Activity (Fachinformationszentrum Karlsruhe, 7514 Eggenstein-Leopoldshafen 2, Germany)

The components of high altitude radiation are identified and its effect on human mortality is examined. Mechanisms of production and motion of primary and secondary high radiation particles and their dependence on the Earth's magnetic field are described. Altitude dependence of cosmic radiation of protons, electrons, and muons are estimated. Radiation risks in aircraft are deduced from stochastic probability reports, and curves of age versus total death probability rate are established, with and without chronic radiation exposure, to show that differences are hardly noticeable. ESA

N93-31929 Dortmund Univ. (Germany). Inst. fuer Arbeitsphysiologie.
EFFECTS ON HEALTH OF NOISE DISTURBANCES DUE TO AIR TRAFFIC [GESUNDHEITLICHE AUSWIRKUNGEN FLUGVERKEHRSBEDINGTER LAERMBELASTUNGEN]
Barbara Griefahn *In* Gesellschaft fuer Strahlenforschung m.b.H., Air Traffic and Environment Nov. 1991 p 25-28 In GERMAN (For primary document see N93-31925 12-45)
Copyright Avail: Issuing Activity (Fachinformationszentrum Karlsruhe, 7514 Eggenstein-Leopoldshafen 2, Germany)

Side effects of sound propagation on ears, vegetative nervous system, and psychosocial relations are examined. Military aircraft noise is reported as possibly damaging to people who live near air force bases. Noise emissions are shown to be disturbing for population rest and sleep and child learning capacities. These psychological and sociological effects can modify human behavior, while they reduce social activities and communications. Noise is depicted as a stress for humans since it accelerates heart frequency and increases blood pressure. ESA

N93-31930 Swissair, Zurich (Switzerland).
THE ECOLOGICAL BALANCE OF SWISSAIR: AN EXAMPLE OF WASTE MANAGEMENT [OEKOBILANZ DER SWISSAIR: BEISPIEL ABFALLBEWAELTIGUNG]
Peter Gutknecht *In* Gesellschaft fuer Strahlenforschung m.b.H., Air Traffic and Environment Nov. 1991 p 29-34 In GERMAN (For primary document see N93-31925 12-45)
Copyright Avail: Issuing Activity (Fachinformationszentrum Karlsruhe, 7514 Eggenstein-Leopoldshafen 2, Germany)

A global analysis of environment related tasks in aeronautical activities is performed as an information base for airline employees and external people. Technical activities and facilities, aircraft, vehicles, wastes, and material stockrooms involved in Swissair tasks were examined from an environmental point of view, as well as aircraft propulsion and maintenance, passengers and employees, energy supply, organization and administration activities and catering, by considering loads of air, water, noise, and wastes. ESA

N93-31931 Hygiene-Inst. des Ruhrgebiets, Gelsenkirchen (Germany).
EFFECTS OF COMMERCIAL FLIGHT POLLUTION ON HUMAN HEALTH [WIRKUNGEN VON FLUGVERKEHRSBEDINGTEN SCHADSTOFFBELASTUNGEN AUF DIE MENSCHLICHE GESUNDHEIT]
Thomas Eikmann *In* Gesellschaft fuer Strahlenforschung m.b.H., Air Traffic and Environment Nov. 1991 p 35-41 In GERMAN (For primary document see N93-31925 12-45)
Copyright Avail: Issuing Activity (Fachinformationszentrum Karlsruhe, 7514 Eggenstein-Leopoldshafen 2, Germany)

Effects of exhaust gases on human people are examined. The study is based on a measurement program, in the neighborhood of two German airports, established for estimating the influence of hydrocarbons and nitrogen oxides on air pollution. The effects of carbon monoxide and nitrogen oxides on respiration was characterized. A relationship between ozone concentration increase and lung diseases was established. Polycyclic aromatic hydrocarbons and benzol were shown to be involved in leukemia and cancer. Biological monitoring is concluded to be necessary for estimation of risks for human beings from aircraft exhaust gases. ESA

N93-31932 Fachhochschule, Munich (Germany). Fachbereich Landschaftspflege.
EFFECTS OF AIR TRAFFIC ON NATURE AND ENVIRONMENT IN THE NEIGHBORHOOD OF AIRPORTS BY EXAMPLE OF THE MUNICH 2 AIRPORT (GERMANY) [AUSWIRKUNGEN DES FLUGVERKEHRS AUF NATUR UND UMWELT IM NAHBEREICH VON FLUGHAEFEN AM BEISPIEL DES FLUGHAFENS MUENCHEN 2]
Christian Magerl *In* Gesellschaft fuer Strahlenforschung m.b.H., Air Traffic and Environment Nov. 1991 p 43-51 In GERMAN (For primary document see N93-31925 12-45)
Copyright Avail: Issuing Activity (Fachinformationszentrum Karlsruhe, 7514 Eggenstein-Leopoldshafen 2, Germany)

The consequences for nature and landscape of the building of the new Munich airport are examined. From an economic point of view, the airport is seen to have created employment but needed widespread surfaces for infrastructures. Noise and ground water reduction has caused the disappearance of numerous birds. It is pointed out that no studies were performed for assessment of ecological damage when the airport design phase started. The risks of bird aircraft collisions are highlighted and it is explained why a biotope dedicated to birds in the airport neighborhood is undesirable. ESA

N93-32027# Cornell Univ., Ithaca, NY.
GEOCHEMICAL, GENETIC, AND PHYSIOLOGICAL CONTROL OF POLLUTANT BIODEGRADATION Annual Report, 30 Sep. 1991 - 29 Sep. 1992
Eugene L. Madsen and Leonard W. Lion 25 Nov. 1992 12 p
(Grant AF-AFOSR-0436-91)
(AD-A264106; AFOSR-93-0303TR) Avail: CASI HC A03/MF A01

The proposed research was designed to utilize a combination of laboratory and field studies to identify physical, chemical, genetic, and physiological influences that govern the accumulation and biodegradation of polycyclic aromatic hydrocarbons (PAH's). These and related compounds are among the chemicals whose environmental fate has been targeted by the U.S. Air Force Bioenvironmental Research Program. We have conducted a prior, independent study that has shown that, despite the presence of PAH mineralizing microorganisms. PAH's persist at a site where freshwater sediments are fed by PAH-contaminated ground water. Hypotheses to be tested address fundamental mechanisms for the persistence of environmental pollutants, these include: (1) the rate of delivery meets or exceeds the rate of biodegradation; (2) the PAH's are not available to microbial populations due to sorption onto the sediment organic matter, complexation reactions with dissolved organic carbon, or due to the physical arrangement of the sediment matrix which prevents contact between PAH's and microorganisms; (3) the microorganisms may be physiologically limited by the presence of preferred metabolic substrates or toxic or inhibitory substances, or by the lack of proper final electron acceptors, electron donors, or inorganic or organic nutrients; and (4) PAH's may persist simply

due to restricted distribution and abundance of biodegradation genes in naturally occurring microbial populations. By working in an iterative manner between field observations and controlled laboratory determinations, we intend to systematically test the above hypotheses and thus identify constraints on microbiological processes that mineralize PAH's (naphthalene and phenanthrene) at the field site. DTIC

N93-32039# New Energy and Industrial Technology Development Organization, Tokyo (Japan).

PRELIMINARY STUDY ON COSTS NEEDED FOR SOLUTION OF THE GLOBAL ENVIRONMENTAL PROBLEM

Mar. 1992 153 p

(DE93-768474; NEDO-P-9124) Avail: CASI HC A08/MF A02

The study is made on measures and costs to reduce CO2, SO(x), and NO(x) emitted by the use of fossil fuel in advanced countries and developing countries. The technology to economically recover a large amount of CO2 emitted from power plants and iron works is now in a stage of research and development. As the technology to recover CO2 in flue gas, wet absorption, dry adsorption, membrane separation, and marine organism utilization methods are under study. Moreover, it is requested that not only CO2 recovery but the whole system including CO2 disposal, etc. should be considered. Reduction cost of CO2 and others is classified by groups of advanced countries (24 OECD countries) and developing countries (other 102 countries), and the cost in a thermal power generation section is estimated as follows: investment in energy conservation in advanced countries and in developing countries is $62.466 billion (130yen/$) and $8.104 billion, respectively, CO2 reduction cost; $1,250 billion and $41,712 billion, respectively; SO(x) reduction cost; $10.664 (leading 4 countries) and $2.860 billion, respectively; and NO(x) reduction cost; $8.976 billion (leading 4 countries) and $1.907 billion, respectively. A total estimate reduction cost of CO2, etc. in the thermal power generation section is $1,386.689 billion. DOE

N93-32040# New Energy and Industrial Technology Development Organization, Tokyo (Japan).

SURVEY ON GLOBAL ENVIRONMENTAL EFFECTS OF PETROLEUM SUBSTITUTION ENERGY UTILIZATION

Mar. 1992 405 p

(DE93-768475; NEDO-P-9125) Avail: CASI HC A18/MF A04

An analysis is made on the present status of Japan's financial policies, energy tax revenues, weight of expenditures for energy measures, energy taxation system, and energy prices, in order to consider implications of present moves around an environmental tax (carbon tax) and introduction of the environmental tax on energy. The thought that the environmental cost should be included in the energy price is fundamentally important for the ultra long term problem having high scientific uncertainties which is global warming. Therefore, an attempt to include external environmental cost in the energy cost is considered by using economic steps like the environment tax step by step. However, even if a common environmental tax is introduced to Japan of which the energy taxation is very different from those in the U.S. and Europe, it can never be fair according to the international standard. Carbon taxes already introduced mostly to North European countries actually reflect their domestic situations clearly. Steady discussions should be given on how to impose the environmental tax on a long term basis, fully allowing for international coordination. DOE

N93-32070# Computer Sciences Corp., Research Triangle Park, NC.

REGIONAL MODELING ANALYSIS OF THE DEPENDENCIES OF ATMOSPHERIC OXIDANTS TO PERTURBATIONS IN NOx AND HYDROCARBON EMISSIONS Symposium Paper

R. Mathur and K. L. Schere 1993 10 p See also PB83-207688, PB89-194252 and PB92-108786 Sponsored by EPA, Research Triangle Park, NC

(Contract EPA-68-WO-0043)

(PB93-180925; EPA/600/A-93/080) Avail: CASI HC A02/MF A01

Atmospheric distribution of photochemical oxidants has been a subject of interest and concern not only because of their deleterious effects on human health and vegetation, but also because of their crucial role in determining the chemical composition of the atmosphere. The paper examines some issues related to the distribution and production of photochemical species and presents an analysis of results obtained from applications of a comprehensive three-dimensional regional scale photochemical model over the northeast United States. The Regional Oxidant Model (ROM) is used to simulate the response of various photochemical species to specific anthropogenic emissions strategies involving NOx and hydrocarbon reductions. Domain and temporal averages of predicted concentrations are examined for various species. Their relative influence on oxidant chemistry over the modeled domain is investigated. The relative benefits of reductions in NOx and hydrocarbon emissions on predicted ozone levels are also examined. Overall, model predictions show good qualitative agreement with expected trends. NTIS

N93-32088# Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

METHODOLOGY TO APPORTION AMBIENT AIR MEASUREMENTS TO INVESTIGATE POTENTIAL EFFECTS ON AIR QUALITY NEAR WASTE INCINERATORS Report, Jan. 1992 - Mar. 1993

S. Mukerjee, D. L. Fox (North Carolina Univ., Chapel Hill.), R. K. Stevens, C. M. Shy (North Carolina Univ., Chapel Hill.), N. Vescio, Thomas A. Lumpkin, and Robert B. Kellogg (ManTech Environmental Technology, Inc., Research Triangle Park, NC.) 1993 12 p

(PB93-191393; EPA/600/A-93/104) Avail: CASI HC A03/MF A01

Ambient air samples at four sites located near two incinerators (a biomedical waste and a municipal incinerator) in the vicinity of Charlotte, North Carolina were acquired as part of a health effects study that is examining potential, short-term, lung dysfunctions associated with incinerator and other source emissions. Ambient monitoring was performed for one month intervals at a treatment and control community site for each of the two incinerator locations. Twelve-hour ambient samples were acquired by means of a Versatile Air Pollution Sampler (VAPS) which enabled sampling for fine (greater than 2.5 micrometers) and coarse (2.5 - 10 micrometers) particulate matter, acid-gases by diffusion sampling and fine carbon sampling on quartz filters. X-ray Fluorescence Spectroscopy (XRF) was used on the coarse and fine particulate filters to measure metals while Ion Chromatography (IC) analyzed acid gases. The Chemical Mass Balance Receptor Model (CMB) was then used on the average ambient data from each wind vector to apportion the contribution of ambient pollutants which were attributable to the sources of interest from a given wind direction. NTIS

N93-32089# Battelle Columbus Labs., OH.

IN-SITU BIOVENTING: TWO US EPA AND AIR FORCE SPONSORED FIELD STUDIES

G. D. Sayles (Environmental Protection Agency, Cincinnati, OH.), R. E. Hinchee, R. C. Brenner (Environmental Protection Agency, Cincinnati, OH.), C. M. Vogel (Air Force Engineering and Services Center, Tyndall AFB, FL.), and R. N. Miller (Air Force Center for Environmental Excellence, Brooks AFB, TX.) 1992 13 p

(Contract EPA-68-C0-0003)

(PB93-194231; EPA/600/A-93/116) Avail: CASI HC A03/MF A01

Bioventing is the process of delivering oxygen by forced air movement through organically contaminated unsaturated soils in order to stimulate in situ biodegradation in an otherwise oxygen-limited environment. The paper is a report on progress of two ongoing bioventing field studies involving JP-4 jet fuel contamination. The first investigation, at Eielson AFB near Fairbanks, Alaska, is a study of bioventing in shallow soils and cold climates in conjunction with an evaluation of soil warming techniques. The second study, at Hill AFB near Salt Lake City, Utah, is examining bioventing of large volumes of soil and determining biodegradation and volatilization rates as a function of air injection rate. NTIS

N93-32090# Electric Power Research Inst., Palo Alto, CA.

PROCEEDINGS: 1991 SO2 CONTROL SYMPOSIUM, VOLUME 2, SESSIONS 4 AND 5A

Apr. 1993 512 p Symposium held in Washington, DC, 3-6 Dec. 1991 See also PB91-197228, PB93-196095 and PB93-19611 Sponsored by EPA and DOE

(PB93-196103; EPRI-TR-101054-Vol-2; EPA/600/R-93/064B-Vol-2)

Copyright Avail: CASI HC A22/MF A04

The proceedings document the 1991 SO2 Control Symposium, held December 3-6, 1991, in Washington, DC, and jointly sponsored by the Electric Power Research Institute (EPRI), the U.S. Environmental Protection Agency (EPA), and the U.S. Department of Energy (DOE). The symposium focused attention on recent improvements in conventional SO2 control

technologies, emerging processes, and strategies for complying with the Clean Air Act Amendments (CAAA) of 1990. It provided an international forum for the exchange of technical and regulatory information on SO2 control technology. More than 800 representatives of 20 countries from government, academia, flue gas desulfurization (FGD) process suppliers, equipment manufacturers, engineering firms, and utilities attended. In all, 50 U.S. utilities and 10 utilities in other countries were represented. In 11 technical sessions, speakers presented 111 technical papers on development, operation, and commercialization of wet and dry FGD, clean coal technologies, and combined sulfur oxide/nitrogen oxide (SOx/NOx) processes. Volume 2 covers sessions on wet FGD design improvements, dry FGD technologies, and wet full scale FGD operations. NTIS

N93-32091# Electric Power Research Inst., Palo Alto, CA.
PROCEEDINGS: 1991 SO2 CONTROL SYMPOSIUM, VOLUME 3, SESSIONS 5B AND 6
Apr. 1993 474 p Symposium held in Washington, DC, 3-6 Dec. 1991 See also PB91-197236, PB93-196103 and PB93-196129 Sponsored by EPA and DOE
(PB93-196111; EPRI-TR-101054-Vol-3; EPA/600/R-93/064C-Vol-3)
Copyright Avail: CASI HC A20/MF A04

The proceedings document the 1991 SO2 Control Symposium, held December 3-6, 1991, in Washington, DC, and jointly sponsored by the Electric Power Research Institute (EPRI), the U.S. Environmental Protection Agency (EPA), and the U.S. Department of Energy (DOE). The symposium focused attention on recent improvements in conventional SO2 control technologies, emerging processes, and strategies for complying with the Clean Air Act Amendments (CAAA) of 1990. It provided an international forum for the exchange of technical and regulatory information on SO2 control technology. More than 800 representatives of 20 countries from government, academia, flue gas desulfurization (FGD) process suppliers, equipment manufacturers, engineering firms, and utilities attended. In all, 50 U.S. utilities and 10 utilities in other countries were represented. In 11 technical sessions, speakers presented 111 technical papers on development, operation, and commercialization of wet and dry FGD, clean coal technologies, and combined sulfur oxide/nitrogen oxide (SOx/NOx) processes. Volume 3 covers sessions on combined SOx/NOx technologies, wet FGD operating issues, and clean coal demonstrations. NTIS

N93-32092# Electric Power Research Inst., Palo Alto, CA.
PROCEEDINGS: 1991 SO2 CONTROL SYMPOSIUM, VOLUME 4, SESSION 7
Apr. 1993 344 p Symposium held in Washington, DC, 3-6 Dec. 1991 See also PB91-197244, PB93-196111 and PB93-196137 Sponsored by EPA and DOE
(PB93-196129; EPRI-TR-101054-Vol-4; EPA/600/R-93/064D-Vol-4)
Copyright Avail: CASI HC A15/MF A03

The proceedings document the 1991 SO2 Control Symposium, held December 3-6, 1991, in Washington, DC, and jointly sponsored by the Electric Power Research Institute (EPRI), the U.S. Environmental Protection Agency (EPA), and the U.S. Department of Energy (DOE). The symposium focused attention on recent improvements in conventional SO2 control technologies, emerging processes, and strategies for complying with the Clean Air Act Amendments (CAAA) of 1990. It provided an international forum for the exchange of technical and regulatory information on SO2 control technology. More than 800 representatives of 20 countries from government, academia, flue gas desulfurization (FGD) process suppliers, equipment manufacturers, engineering firms, and utilities attended. In all, 50 U.S. utilities and 10 utilities in other countries were represented. In 11 technical sessions, speakers presented 111 technical papers on development, operation, and commercialization of wet and dry FGD, clean coal technologies, and combined sulfur oxide/nitrogen oxide (SOx/NOx) processes. Volume 4 contains poster papers which discuss injection methods, scrubbing systems, catalytic baghouse processes, clean coal technology, and wet as well as dry FGD. NTIS

N93-32093# Electric Power Research Inst., Palo Alto, CA.
PROCEEDINGS: 1991 SO2 CONTROL SYMPOSIUM, VOLUME 5, SESSION 8
Apr. 1993 297 p Symposium held in Washington, DC, 3-6 Dec. 1991 See also PB93-196129 Sponsored by EPA and DOE
(PB93-196137; EPRI-TR-101054-Vol-5; EPA/600/R-93/064E-Vol-5)
Copyright Avail: CASI HC A13/MF A03

The proceedings document the 1991 SO2 Control Symposium, held December 3-6, 1991, in Washington, DC, and jointly sponsored by the Electric Power Research Institute (EPRI), the U.S. Environmental Protection Agency (EPA), and the U.S. Department of Energy (DOE). The symposium focused attention on recent improvements in conventional SO2 control technologies, emerging processes, and strategies for complying with the Clean Air Act Amendments (CAAA) of 1990. It provided an international forum for the exchange of technical and regulatory information on SO2 control technology. More than 800 representatives of 20 countries from government, academia, flue gas desulfurization (FGD) process suppliers, equipment manufacturers, engineering firms, and utilities attended. In all, 50 U.S. utilities and 10 utilities in other countries were represented. In 11 technical sessions, speakers presented 111 technical papers on development, operation, and commercialization of wet and dry FGD, clean coal technologies, and combined sulfur oxide/nitrogen oxide (SOx/NOx) processes. Volume 5 covers sessions on commercial FGD designs and by-product utilization. NTIS

N93-32166 International Bank for Reconstruction and Development, Washington, DC.
INDIGENOUS VIEWS OF LAND AND THE ENVIRONMENT World Bank Discussion Paper
S. H. Davis 1993 102 p
(PB93-186898; WORLDBANK/DP-188) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

The report, which was written as a background paper for the World Development Report 1992 on Development and the Environment, has particular relevance to the World Bank and its Borrower Countries. The World Bank was the first multilateral agency to issue a special policy for the treatment of indigenous peoples in internationally-funded development projects. The first article describes a forestry management project being designed and carried out by a Quichua-speaking Indian federation in eastern Ecuador. The second and third articles in the report deal with land use and environmental issues facing the Maasai and Samburu, two ethnically-related pastoral peoples who live in the East African nation of Kenya. The study of tribal Filipinos, identifies the problems that upland swidden cultivators face in gaining recognition of their land rights and respect for their traditional land-use practices. Finally, appended to the report is a statement by the Coordinating Body for the Indigenous People's Organizations of the Amazon Basin (COICA), which was presented to the World Bank and other international aid and lending institutions. NTIS

N93-32168 Environmental Protection Agency, Research Triangle Park, NC. Air and Energy Engineering Research Lab.
PROCEEDINGS OF THE 1991 SO2 CONTROL SYMPOSIUM, VOLUME 1
Apr. 1993 438 p Symposium held in Washington, DC, 3-6 Dec. 1991 See also PB91-197210 and Volume 2, PB93-196103 Sponsored by EPA, Research Triangle Park, NC, DOE, Pittsburg, PA, and Electric Power Research Inst., Palo Alto, CA
(PB93-196095; EPRI-TR-101054-Vol-1; EPA/600/R-93/064A) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

The proceedings document the 1991 SO2 Control Symposium, held December 3-6, 1991, in Washington, DC, and jointly sponsored by the Electric Power Research Institute (EPRI), the U.S. Environmental Protection Agency (EPA), and the U.S. Department of Energy (DOE). The symposium focused attention on recent improvements in conventional SO2 control technologies, emerging processes, and strategies for complying with the Clean Air Act Amendments (CAAA) of 1990. It provided an international forum for the exchange of technical and regulatory information on SO2 control technology. More than 800 representatives of 20 countries from government, academia, flue gas desulfurization (FGD) process suppliers, equipment manufacturers, engineering firms, and utilities attended. In all, 50 U.S. utilities and 10 utilities in other countries were represented. In 11 technical sessions, speakers presented 111 technical papers on development, operation, and commercialization of wet and dry FGD, clean coal technologies, and combined sulfur oxide/nitrogen oxide (SOx/NOx) processes. Volume 1 covers sessions on Clean Air Act compliance, wet FGD process improvements, and furnace sorbent injection. NTIS

N93-32188# Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
SOURCE APPORTIONMENT OF AIR POLLUTION IN CHINA: EXTENDING THE USEFULNESS OF RECEPTOR MODELING BY COMBINING MULTIVARIATE AND CHEMICAL MASS BALANCE MODELS
M. P. Zelenka, W. E. Wilson, and P. J. Lioy 1993 18 p Prepared in cooperation with Environmental and Occupational Health Services, Piscataway, NJ and NOAA, Research Triangle Park, NC
(PB93-185726; EPA/600/A-93/088) Avail: CASI HC A03/MF A01

The research explores the possibility of using a two step method of identifying and quantifying air pollution emissions in an urban environment. The procedures use a mathematical model called Target Transformation Factor Analysis (TTFA) to estimate source profiles using ambient trace element air concentration data. A source profile is analogous to a fingerprint since it is unique to each source of air pollution. The profiles estimated by TTFA are then employed in a Chemical Mass Balance (CMB) source apportionment analysis for the air shed. Other known sources are estimated using source signatures from the literature. Applying the TTFA and CMB models in this fashion is called receptor modeling. Generically, a receptor model is the combination of measured air pollution concentration data with a numerical technique which apportions the measured air pollution among distinct source types. The results show that TTFA can be used to provide quantitative estimates of air pollution source profiles for an urban center in China. The number of profiles for unique source types was limited for the data set since emissions from certain types of sources covaried during each sampling day. Consequently, the CMB analyses that applied the TTFA source profiles needed to be supplemented with standard U.S. EPA source profiles. Author

N93-32189# Connecticut Univ., Storrs. Dept. of Civil Engineering.
RELATIONSHIPS BETWEEN OZONE PRECURSOR LEVELS AND RESPONSE TO EMISSIONS REDUCTIONS: ANALYSIS OF REGIONAL OXIDANT MODEL RESULTS FOR THE NORTHEASTERN UNITED STATES Final Report, Oct. 1991 - Feb. 1993
J. Milford, D. Gao, and A. Zafirakou Apr. 1993 143 p Sponsored by EPA, Research Triangle Park, NC
(PB93-186294; EPA/600/R-93/075) Avail: CASI HC A07/MF A02

A detailed analysis of results from the Regional Ozone Modeling for Northeast Transport (ROMNET) study has been conducted to examine the conditions under which alternative control strategies were predicted to be effective in improving air quality. The ROMNET study had predicted that for most of the northeastern United States, reducing nitrogen oxides (NOx) emissions by about 60 percent would be more effective in reducing ozone than reducing anthropogenic reactive organic gas (ROG) emissions by approximately the same proportion. However, for the New York City and Baltimore-Washington areas, ROG controls were predicted to be highly effective and NO(x) controls to be counterproductive. The authors recommend further investigation of the idea that NO(y) concentrations could serve as an indicator of the likely sensitivity of O3 to ROG or NO(x) controls, if NO(y) is monitored along with peak O3 during photochemical air pollution episodes. Author

N93-32393# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
TESTS ON SEMI-LAGRANGIAN TRANSPORT AND INTERPOLATION
M. vanLoon Aug. 1992 25 p
(CWI-NM-R921M; ETN-93-94145) Copyright Avail: CASI HC A03/MF A01

Five different interpolation methods are discussed and results of numerical experiments are presented. In air pollution models, semi-Lagrangian methods are often used to solve the advective part of the corresponding model equation. Interpolation is an essential part of these methods. To keep the concentration field non-negative, filtering techniques are used. Also a monotone interpolation method is examined. The analysis shows that Lagrange interpolation seems to be a suitable choice for the semi-Lagrangian method. It uses as many grid point values as Hermite interpolation, but it has a higher order of accuracy. The examination of the possibility of combining the fifth order interpolant with a good filtering procedure is suggested. ESA

N93-32424# National Defence Research Establishment, Umea (Sweden). NBC Defence Dept.
ATMOSPHERIC DISPERSION OF AIR POLLUTANTS IN UMEA (SWEDEN) [SPRIDNING AV LUFTFOERORENINGAR I UMEAA]
Per-Erik Johansson Aug. 1992 21 p In SWEDISH
(FOA-C-40300-4.5; ETN-93-94029) Avail: CASI HC A03/MF A01; National Defeence Research Establishment, S-901 82 Umea, Sweden, HC

A description of the meteorological conditions affecting the dispersion of pollutants during winter in the northern parts of Sweden is given. Generally accepted results are summarized, for example that higher concentration levels are to be expected in cold, calm situations with stable stratification. Measurements are used to show that such situations are frequent during winter in Umea. Winter mean temperatures close to the normal value are found to be rare. During the last 14 winter seasons, only one season has deviated less than 0.5C from the normal value. It is also shown that, during winter the concentrations of black smoke may be higher in small inland communities in the northern parts of Sweden than in much larger cities as for example Stockholm, although the emissions are considerably smaller. ESA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N93-31041*# New Orleans Univ., LA. Dept. of Physics.
DETERMINATION OF DESIGN AND OPERATION PARAMETERS FOR UPPER ATMOSPHERIC RESEARCH INSTRUMENTATION TO YIELD OPTIMUM RESOLUTION WITH DECONVOLUTION. APPENDIX 7 Final Report
George E. Ioup and Juliette W. Ioup 2 Apr. 1993 203 p
(Grant NAG1-804)
(NASA-CR-192836; NAS 1.26:192836) Avail: CASI HC A10/MF A03

Because of the interesting science which can be performed using a satellite attached by a very long tether to a mother vehicle in orbit, such as the Space Shuttle, NASA will deploy TSS-1 (Tethered Satellite System) in 1992. A very long tether (20 km in this case) has the possibility of undergoing oscillations of several different types, or modes, and higher harmonics of these modes. The purpose of this document is to describe a method for detecting the amplitude, frequency, and phase (and predicting future motion in the steady state) of these modes, in particular, the skiprope mode, using tethered satellite dynamics measurements. Specifically the rotation rate data about two orthogonal axes, calculated from output from satellite gyroscopes, are used. The data of interest are the satellite pitch and roll rate measurements. NASA has determined to use two methods to diagnose skiprope properties and predict future values. One of these, a Fourier transform domain approach, is the subject of this notebook. The main program and all subroutines are described along with the test plan for evaluating the Frequency Domain Skiprope Observer.

Derived from text

N93-31062# Northwest Research Associates, Inc., Bellevue, WA.
AN INVESTIGATION OF METHODS FOR IMPROVING MODELS OF IONOSPHERIC PLASMA-DENSITY IRREGULARITIES AND RADIO-FREQUENCY SCINTILLATION
James A. Secan, Robert M. Bussey, Edward J. Fremouw, and Lee A. Reinleitner 1 Mar. 1993 57 p
(Contract F19628-91-C-0152)
(AD-A264156; NWRA-CR-93-R093; PL-TR-93-2050; SR-1) Avail: CASI HC A04/MF A01

Many modern military systems used for communications, command and control, navigation, and surveillance depend on reliable and relatively noise-free transmission of radiowave signals through the earth's ionosphere. Small-scale irregularities in the ionospheric density can cause severe distortion, known as radiowave scintillation, of both the amplitude and phase of these signals. The WBMOD computer program can be used to estimate these effects on a wide range of systems. The objective of this study is to investigate improvements to the WBMOD model based on extensive data sets covering both the equatorial and high-latitude regimes. This report summarizes the work completed during the first year, which

includes construction of the modeling database, development of a new format for the internal representation of the irregularity strength, and development of new models for the diurnal, latitudinal, seasonal, and longitudinal variations in the equatorial region. DTIC

N93-31081# International Centre for Theoretical Physics, Trieste (Italy).
2 + 1 GRAVITY WITHOUT DYNAMICS
V. Husain Jun. 1992 8 p
(DE92-642587; IC-92/102) Avail: CASI HC A02/MF A01 (US Sales Only)

A three dimensional generally covariant theory is described that has a 2 + 1 canonical decomposition in which the Hamiltonian constraint, which generates the dynamics, is absent. Physical observables for the theory are described and the classical and quantum theories are compared with ordinary 2 + 1 gravity. DOE

N93-31106 Toronto Univ. (Ontario).
OROGRAPHICALLY FORCED INTERNAL-WAVE INSTABILITY Ph.D. Thesis
John F. Scinocca 1992 241 p
(ISBN-0-315-73891-X) Avail: Univ. Microfilms Order No. DANN73891

The central focus of this research is the investigation and analysis of the dynamics of unstable topographically forced internal gravity wave. In the first section, two nonlinear numerical studies of this phenomenon are undertaken. The first study considers downslope windstorm development in an environment in which a critical layer is present. In addition to the two governing parameters (critical-level height and inverse Froude number) whose influence has been previously investigated in the literature, the influence of a third nondimensional governing parameter namely the Richardson number at the critical level is considered. This analysis demonstrates that this previously unexplored parameter dependence was apparently the source of some confusion in past investigations of this problem. The second numerical study undertaken is of the simpler problem of downslope windstorm development under conditions of constant wind and static stability far upstream of the topography. These integrations are initialized with Long's analytical solution and are calculated in a model domain which employs three levels of interactive grid nesting. In this manner, the resolution achieved is approximately a factor of ten greater than that previously employed for this problem. As a result of the increased resolution, three distinct stages of windstorm development are explicitly identified. It is furthermore demonstrated that this particular flow evolution can be qualitatively and, to some extent, quantitatively reproduced in a parallel flow extracted from Long's solution if a horizontally localized forcing, designed to enhance the shear in the background wind field, is imposed. The second section involves the derivation and application of a new type of flow diagnostic that may be applied to two dimensional stratified flow problems. Exact, finite-amplitude, local wave-activity conservation laws are derived for disturbances to steady flows in the context of the two-dimensional anelastic and Boussinesq equations. The conservation laws are expressed entirely in terms of Eulerian quantities, and have the property that, in the limit of a small-amplitude, slowly-varying, monochromatic wave train, the wave activity density A and flux F, when averaged over phase, satisfy F = c(sub g)A where c(sub g) is the group velocity of the waves. For non-parallel steady flows, the only conserved wave activity is a form of disturbance pseudoenergy. When the steady flow is parallel, there is in addition a conservation law for the disturbance pseudomomentum. In the application of these wave-activity quantities, the pseudoenergy flow diagnostics are employed in the analysis of the numerically generated flows presented in the first section. As a result of this initial investigation it is demonstrated that the wave-activity diagnostics are useful in identifying and chronicling the life cycles of normal-mode structures in these rather complicated flows. Dissert. Abstr.

N93-31130 Tufts Univ., Medford, MA.
GRAVITATION OF GLOBAL TOPOLOGICAL DEFECTS Ph.D. Thesis
Urruticoechea Manuel Barriola 1992 83 p
Avail: Univ. Microfilms Order No. DA9304484

We study the gravitational effects of global defects. In Chapter 2 we present an approximate solution of the Einstein equations for the metric outside a monopole resulting from the breaking of a global SO(3) symmetry. The monopole exerts practically no gravitational force on nonrelativistic matter, but the space around it has a deficit solid angle, and all light rays are deflected by the same angle, independent of the impact parameter. We discuss also the cosmological evolution of monopoles. In Chapter 3 we decouple the Einstein and scalar field equations for a self-similar global texture. We reduce the system of equations to a single differential equation for one function. We study some of the properties of the full metric and find expressions for the null radial geodesics. An interesting result is that the metric is asymptotically static (t approaches infinity) and describes a space with a deficit solid angle. In section 3F we find approximate analytical solutions to the metric and scalar field of a self-similar texture. We find also a simple expression for the line element in co-moving coordinates. Dissert. Abstr.

N93-31155 California Univ., Los Angeles.
EDDY VORTICES PRODUCED BY NONLINEAR REFLECTION OF A GRAVITY WAVE AT A CRITICAL LEVEL Ph.D. Thesis
Daniel Marc Landau 1992 287 p
Avail: Univ. Microfilms Order No. DA9310904

The internal gravity waves generated by flow over orography are numerically simulated with a new finite element model. When the vertically propagating wave approaches a critical level (wind flow reversal) the wave interacts with the critical level resulting in wave breaking, reflection of energy from the critical level, and the formation of vortices in the wave field. Without doubt, this problem is of concern to aviators. Although previous studies have addressed reflection and wave breaking, no previous study raised questions examining the validity of its own theories. Here a brash approach is used to expose the weakness and strengths of various theories while comparing them with simulated observations. From the observations we have cataloged several stages during the life cycle of an interacting wave, and have produced an energy budget. Each stage requires a separate theory. Significant amounts of wave reflection occur only during later periods, and we have linked this to the formation of the eddy vortices. While some researchers would be satisfied with the explanation that reflection is merely radiant energy arising from the area of convection and turbulence in the zone of wave breaking near a critical level, they would be very interested to learn that the large amount of energy of the reflected wave may be accounted for not from the release of gravitational potential energy as suggested above but rather from the direct transfer of energy from the mean flow and the energy of the main incident wave. Along this line, a model has been developed which produces results which mimic the observations: a second harmonic reflected wave grows rapidly while interacting with the incident wave. Dissert. Abstr.

N93-31304# International Centre for Theoretical Physics, Trieste (Italy).
RADIATION REACTION FOR THE CLASSICAL RELATIVISTIC SPINNING PARTICLE IN SCALAR, TENSOR AND LINEARIZED GRAVITATIONAL FIELDS
A. O. Barut and M. G. Cruz Aug. 1992 10 p
(DE93-608191; IC-92/210) Avail: CASI HC A02/MF A01 (US Sales Only)

The method of analytic continuation of the equation of motion including the self-fields is used to evaluate the radiation reaction for a classical relativistic spinning point particle in interaction with scalar, tensor, and linearized gravitational fields in flat spacetime. In the limit these equations reduce to those of spinless particles. The renormalizability of these theories is also shown. DOE

N93-31305# International Centre for Theoretical Physics, Trieste (Italy).
BRST COHOMOLOGY RING IN 2D GRAVITY COUPLED TO MINIMAL MODELS
H. Kanno and M. H. Sarmadi Aug. 1992 20 p
(DE93-608192; IC-92/150) Avail: CASI HC A03/MF A01 (US Sales Only)

The ring structure of Lian-Zuckerman states for (q,p) minimal models coupled to gravity is shown to be R = R(sub 0) tensor product C(w,w(sup -1)) where R(sub 0) is the ring of ghost number zero operators generated by two elements and w is an operator of ghost number -1. Some examples are discussed in detail. For these models the currents are also discussed and their algebra is shown to contain the Virasoro algebra. DOE

N93-31594 Royal Netherlands Meteorological Inst., De Bilt.
THE PARAMETERIZATION OF VERTICAL TURBULENT MIXING PROCESSES IN A GENERAL CIRCULATION MODEL OF THE TROPICAL PACIFIC
G. Janssen 1992 86 p
(KNMI-WR-92-03; ISBN-9-03-692022-1; ETN-93-93926) Copyright Avail: Issuing Activity (Royal Netherlands Meteorological Inst., P.O. Box 201, 3730 AE De Bilt, Wilhelminalaan 10, Netherlands)

A study to obtain a deeper understanding of how the parameterization of vertical turbulence affects the equatorial surface current/undercurrent dynamics and the equatorial upwelling is reported. Attention is paid to the ocean part of the system only. Some physical processes influencing equational dynamics are discussed, and a description of the Ocean General Circulation Model (OGCM) with which the experiments were conducted, is given. It is found that the inclusion of a surface mixed layer can have a strong effect on both the temperature and the velocity structure of the modeled equatorial Pacific. The modeled surface sea temperatures are in better agreement with observational data and a deep warm pool in the western Pacific can develop. It is concluded that surface mixing in a coarse resolution GCM of the equatorial Pacific improves its performance. ESA

N93-31606 Politecnico di Milano (Italy). Dipt. di Elettronica.
THE SHOT CONTINUATION OPERATOR [L'OPERATORE DI CONTINUAZIONE DI SORGENTE]
Claudio Bagaini 1992 12 p In ITALIAN
(Rept-92-065; ETN-93-93995) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

An operator for developing the common shot seismic section is presented. This Shot Continuation Operator (SCO) allows the transformation of a common shot section in another adjacent one by velocity model data. The SCO combines the offset continuation operator, allowing complete navigation in data space. The characteristics of varying space-time and the sensitivity in comparison to the velocity model used give a possible tool for velocity analysis. ESA

N93-31625# Royal Inst. of Tech., Stockholm (Sweden). Alfven Lab.
ONE-DIMENSIONAL NUMERICAL SIMULATIONS OF THE LOW-FREQUENCY ELECTRIC FIELDS IN THE CRIT1 AND CRIT2 ROCKET EXPERIMENTS
O. Bolin and N. Brenning Apr. 1992 54 p Sponsored by Swedish Board for Space Activities, and Swedish Natural Science Research Council, Stockholm
(TRITA-ALP-1992-01; ETN-93-94210) Avail: CASI HC A04/MF A01

One dimensional numerical particle simulations were performed of the ionospheric barium injection experiments CRIT1 and CRIT2, which were designed to study the Critical Ionization Velocity (CIV) hypothesis proposed by Alfven, using a realistic model for the shape and the time development of the injected neutral cloud. The electrodynamic response of the ionosphere to these injections is modeled by magnetic field aligned currents, using the concept of Alfven conductivity. The results show very good agreement with the CRIT data, especially concerning the low frequency oscillations that were seen after the initial phase of the injections. The shapes, amplitudes, phases, and decay times of the electric fields are all very close to the values measured in the CRIT experiments. ESA

N93-31803# Wyoming Univ., Laramie. Dept. of Physics and Astronomy.
AEROSOL OPTICAL PROPERTIES OF THE FREE TROPOSPHERE
James M. Rosen 30 Dec. 1992 14 p
(Contract F19628-90-K-0011)
(AD-A265795; PL-TR-93-2045; AD-E201462; SR-3) Avail: CASI HC A03/MF A01

In two balloon flights over Laramie, Wyoming, simultaneous measurements of aerosol backscatter and total aerosol scatter were successfully obtained. The data have been analyzed and used to directly measure the extinction-to-backscatter ratio under the assumption that the aerosols are relatively non-absorbing (small imaginary component to the index of refraction). The results are consistent with previous estimates of the extinction-to-backscatter ratio, although very little information is available relevant to direct measurements of this important parameter. It is concluded that the new instruments and techniques employed here will provide a practical method of obtaining a wealth of new information concerning the extinction-to-backscatter ratio of tropospheric aerosols. DTIC

N93-31872# Weidlinger Associates, Los Altos, CA.
NUMERICAL METHODS FOR INVERSE PROBLEMS IN THREE-DIMENSIONAL GEOPHYSICAL MODELING, PHASE 2 Final Report
V. Pereyra Aug. 1989 255 p Sponsored by NSF, Washington, DC
(Grant NSF ISI-86-19607)
(PB93-181584; NSF/ISI-89169) Avail: CASI HC A12/MF A03

Researchers are performing interactive modeling on powerful workstations coupled with supercomputers to construct mathematical models of the Earth interior. The report discusses some of the mathematical and computational issues involved in developing the modeling environment, concentrating on modeling Earth's elastic properties by seismic methods. The work extends forward and inverse modeling techniques to highly complex geological models, called blocky. A volume of Earth is represented by a collection of smooth inhomogeneous rock masses separated by material interfaces, where elastic properties change discontinuously. These interfaces have been modeled by surface patches that allow the construction of many complex geological unconformities. Issues of geometrical and material description are considered first. These issues are basic to the direct and inverse modeling techniques. Seismic ray tracing is the forward modeling technique, while inverse modeling is divided between static and dynamic modeling. In the static case, a variation of forward modeling is used only once to determine a preliminary model from measured data. This preliminary model is used to initialize an optimization iteration. In this dynamic inversion loop, forward modeling is used at each step, and therefore large computational resources may be required. NTIS

N93-31878*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
THE FIRST ANNUAL WEST ANTARCTIC ICE SHEET (WAIS) SCIENCE WORKSHOP
Robert A. Bindschadler, ed. Jul. 1993 57 p Workshop held in Arlington, VA, 13-14 Sep. 1992 Sponsored in part by NSF
(RTOP 971-00-00)
(NASA-CP-3222; Rept-93A01457; NAS 1.55:3222) Avail: CASI HC A04/MF A01

A compilation of abstracts presented at the workshop are presented. The goal was to answer the question, what is the future behavior and potential for rapid collapse of the West Antarctic Ice Sheet (WAIS)? The workshop was organized into four sessions corresponding to the four objectives identified as necessary to reach the WAIS workshop goal: history, current behavior, internal dynamics, and environmental interactions. Presentations were organized by their relevance to each objective, rather than by discipline. For individual titles, see N93-31879 through N93-31904.

N93-31879*# Rice Univ., Houston, TX. Dept. of Geology and Geophysics.
RECONSTRUCTION OF LATE WISCONSINAN ICE SHEET AND SEA-LEVEL IMPLICATIONS Abstract Only
John B. Anderson *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 3 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

The Ross Sea exhibits north-south oriented troughs associated with modern ice streams and outlet glaciers. Seismic reflection profiles across the troughs show evidence that they were glacially eroded. Seismic records show morphologic features interpreted as till tongues, morainal banks, and possibly glacial deltas formed near the grounding line of the former marine ice sheet. Piston cores from the continental shelf penetrated diamictons whose origin and age is problematic. Detailed petrographic analyses of the minerals and rocks comprising these diamictons were conducted to determine subglacial versus glacial marine origin, and to reconstruct the glacial setting of the Ross Sea during the most recent glacial maximum. The most detailed work, conducted in the western Ross Sea, shows that diamictons do occur in distinct petrologic provinces. This is consistent with deposition from the basal debris zone of either an ice sheet or an ice shelf. Overcompaction, in conjunction with the widespread nature of these deposits, favors deposition from marine ice sheets; ice shelves are believed

to deposit their basal debris close to the grounding lines. Other results from the investigation are briefly discussed. Author (revised)

N93-31880*# Colorado Univ., Boulder. Inst. of Alpine and Arctic Research.
LITHOLOGY AND CHRONOLOGY OF ICE-SHEET FLUCTUATIONS (MAGNETIC SUSCEPTIBILITY OF CORES FROM THE WESTERN ROSS SEA) Abstract Only
Anne E. Jennings *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 4 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

The goals of the marine geology part of WAIS include reconstructing the chronology and areal extent of ice-sheet fluctuations and understanding the climatic and oceanographic influences on ice-sheet history. As an initial step toward attaining these goals, down-core volume magnetic susceptibility (MS) logs of piston cores from three N-S transects in the western Ross Sea are compared. The core transects are within separate petrographic provinces based on analyses of till composition. The provinces are thought to reflect the previous locations of ice streams on the shelf during the last glaciation. Magnetic susceptibility is a function of magnetic mineral composition, sediment texture, and sediment density. It is applied in the western Ross Sea for two purposes: (1) to determine whether MS data differentiates the three transects (i.e., flow lines), and thus can be used to make paleodrainage reconstructions of the late Wisconsinan ice sheet; and (2) to determine whether the MS data can aid in distinguishing basal till diamictons from diamictons of glacial-marine origin and thus, aid paleoenvironmental interpretations. A comparison of the combined data of cores in each transect is presented. Author (revised)

N93-31881*# Ohio State Univ., Columbus. Polar Research Center.
MACROFOSSIL RECORDS OF WEST ANTARCTIC ICE SHEET RETREAT DURING THE HOLOCENE Abstract Only
Paul Arthur Berkman *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 5 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

Marine macrofossils in emerged beaches around Antarctica represent a geochemical framework for interpreting meltwater signatures associated with variations in the adjacent ice sheet margins during the last 10,000 years. In particular, mollusc species provide ideal experimental templates for assessing hydrochemical variations in Antarctic coastal marine environments because of their excellent preservation, high abundances, circumpolar distributions, and carbonate shells, which incorporate trace elements and stable isotopes. Modern samples of the bivalve Adamussium colbecki, which were collected across a depth gradient in the vicinity of a glacial meltwater stream in West McMurdo Sound, revealed shell trace element concentrations that were significantly higher above 10 meters because of their exposure to meltwater runoff. This meltwater signature also was reflected by the shell oxygen isotopic composition, which was in equilibrium with the ambient seawater, as demonstrated by the overlap between the predicted and actual O-(delta-18)sub w values. These modern samples provide analogs for interpreting the geochemical records in their fossils, which were based solely on molluscan fossils, complement the above geochemical data by suggesting that the rate of beach emergence fluctuated around Antarctica during the mid-Holocene. Paleoenvironmental analysis of macrofossils from emerged beaches represents a new direction in Antarctic research that can be used to assess changes in the margins of the ice sheets since the Last Glacial Maximum. The resolution of these analyses will be enhanced by collaborations that are developing with scientists who are conducting comparable studies in other coastal regions around the continent. Author (revised)

N93-31882*# Ohio State Univ., Columbus. Polar Research Center.
THE DIATOM RECORD FROM BENEATH THE WEST ANTARCTIC ICE SHEET AND THE GLOBAL PROXY PERSPECTIVE Abstract Only
Reed P. Scherer *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 6 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

Recent glaciological evaluation and modeling of the marine-based West Antarctic Ice Sheet (WAIS) support the possibility that the WAIS disintegrated during one or more Pleistocene interglacial period(s). The magnitude of sea level and oxygen isotope variation during certain late-Pleistocene interglacial periods is also consistent with the possibility of major retreat of the WAIS. Although oxygen isotopes from deep-sea sediments provide the best available proxy record for global ice volume (despite the ambiguities in the record), the source of ice volume changes must be hypothesized. Based on the intensity of interglacial isotopic shifts recorded in Southern Ocean marine sedimentary records, stage 11 (400,000 years ago) is the strongest candidate for WAIS collapse, but the records for stages 9, 7, and 5.5 are all consistent with the possibility of multiple late-Pleistocene collapses. Seismic reflection studies through the WAIS have revealed thick successions of strata with seismic characteristics comparable to upper Tertiary marine sediments. Small samples of glacial diamictons from beneath the ice sheet have been collected via hot-water drilled access holes. These sediments include mixed diatom assemblages of varying ages. Late-Miocene diatoms dominate many samples, probably reflecting marine deposition in West Antarctic basins prior to development of a dominantly glacial phase in West Antarctica. In addition to late-Miocene diatoms, samples from Upstream B (1988/89) contain rare post-Miocene diatoms, many of which imply deposition in the West Antarctic interior during one or more Pleistocene deglaciation periods. Age-diagnostic fossils in glacial sediments beneath ice sheets provide relatively coarse chronostratigraphic control, but they do contain direct evidence of regional deglaciation. Thus, sub-glacial till samples provide the evidence regarding the source of ice sheet variability seen in well-dated proxy records. Combined, these independent data sets can provide a more comprehensive and less speculative interpretation of the history of past glacial minima in currently glaciated polar regions. Author (revised)

N93-31883*# Washington Univ., Seattle. Quaternary Isotope Lab.
RECONNAISSANCE AND DEEP-DRILL SITE SELECTION ON TAYLOR DOME, ANTARCTICA Abstract Only
Pieter M. Grootes and Edwin D. Waddington *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 7-8 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

Taylor Dome is a small ice dome near the head of Taylor Valley, Southern Victoria Land. The location of the dome, just west of the Transantarctic Mountains, is expected to make the composition of the accumulating snow sensitive to changes in the extent of the Ross Ice Shelf. Thus, it is linked to the discharge of the West Antarctic Ice Sheet but protected against direct influences of glacial-interglacial sea-level rise. The record of past climatic and environmental changes in the ice provides a valuable complement to the radiocarbon-dated proxy record of climate derived from perched deltas, strandlines, and moraines that have been obtained in the nearby Dry Valleys. We carried out a reconnaissance of the Taylor Dome area over the past two field seasons to determine the most favorable location to obtain a deep core to bedrock. A stake network has been established with an 80-km line roughly along the crest of Taylor Dome, and 40-km lines parallel to it and offset by 10 km. These lines have been surveyed 1990/91, and the positions of 9 grid points have been determined with geoceivers. A higher density stake network was placed and surveyed around the most likely drill area in the second year. Ground-based radar soundings in both years provided details on bedrock topography and internal layering of the ice in the drill area. An airborne radar survey in January 1992, completed the radar coverage of the Taylor Dome field area. Author (revised)

N93-31884*# Chicago Univ., IL. Dept. of Geophysical Sciences.
IRREGULAR OSCILLATIONS OF THE WEST ANTARCTIC ICE SHEET Abstract Only
Douglas R. MacAyeal *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 9 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

Model simulations of the West Antarctic ice sheet suggest that sporadic, perhaps chaotic, collapse (complete mobilization) of the ice sheet occurred throughout the past one million years. The irregular behavior is due to the slow equilibration time of the distribution of basal till, which lubricates ice-sheet motion. This nonlinear response means that predictions of future

collapse of the ice sheet in response to global warming must take into account its past history, and in particular, whether the present basal till distribution predisposes the ice sheet towards rapid change. Author

N93-31885*# Geological Survey, Flagstaff, AZ.
VELOCITIES OF THWAITES AND LAND GLACIERS Abstract Only
B. K. Lucchitta, Kevin F. Mullins, and J. G. Ferrigno (Geological Survey, Reston, VA.) *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 15-17 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

Changes in the area of volume of polar ice sheets are intricately linked to changes in global climate and may severely impact the densely populated coastal regions on Earth. An ice sheet's velocity is a critical parameter, which, together with ice thickness, allows the determination of discharge rates. Using moderate-resolution satellite images such as Landsat, the velocity of floating ice can be measured quickly and relatively inexpensively by tracing crevasse patterns on shelves and ice tongues. Errors in measured velocities are as little as 0.02 km per year, if the following criteria are met: (1) the time interval is longer than 10 years; (2) the velocity is higher than 0.5 km per year; (3) the coregistration points are well dispersed and enclose the area to be measured; and (4) the image pair includes a Landsat 4 or 5 image. The fewer of these conditions that are met, the less accurate the results become; but even for poor conditions, the velocities are generally reliable to near 0.1 km per year. We are in the process of obtaining velocities of all ice shelves and ice tongues along the Bakutis and Ruppert coasts, wherever suitable crevasse patterns exist. So far, we have obtained velocities for the Thwaites and Land glacier tongues. Author (revised)

N93-31886*# Ohio State Univ., Columbus. Polar Research Center.
CONDITION OF THE ROSS ICE SHELF DERIVED FROM AVHRR IMAGERY Abstract Only
Gino Casassa *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 18 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

Advanced Very High Resolution Radiometer (AVHRR) satellite imagery is combined with the Ross Ice Shelf Geophysical and Glaciological Survey (RIGGS) data to study recent changes on the Ross Ice Shelf. Flow stripes that appear on the AVHRR imagery agree with significant changes in ice flow that have occurred over the past 1,100 years on the ice shelf sector fed by East Antarctica. A large looping pattern of flow stripes that disagrees with RIGGS flow lines appears west of Crary Ice Rise, on the eastern part of the ice shelf. This looped pattern is interpreted as relict flow stripes related to past activity of a major ice stream of West Antarctica, which occurred about 800 years ago. Author (revised)

N93-31887*# Ohio State Univ., Columbus. Polar Research Center.
SPOT SATELLITE MAPPING OF ICE STREAM B Abstract Only
Carolyn J. Merry *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 19 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

Numerous features of glaciological significance appear on two adjoining SPOT High Resolution Visible (HRV) images that cover the onset region of ice stream B. Many small-scale features, such as crevasses and drift plumes, have been previously observed in aerial photography. Subtle features, such as long flow traces that have not been mapped previously, are also clear in the satellite imagery. Newly discovered features include ladder-like runners and rungs within certain shear margins, flow traces that are parallel to ice flow, unusual crevasse patterns, and flow traces originating within shear margins. An objective of our work is to contribute to an understanding of the genesis of the features observed in satellite imagery. The genetic possibilities for flow traces, other lineations, bands of transverse crevasses, shear margins, mottles, and lumps and warps are described. Author (revised)

N93-31888*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
THE MASS BALANCE OF THE ICE PLAIN OF ICE STREAM B AND CRARY ICE RISE Abstract Only
Robert Bindschadler *In its* The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 20 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

The region in the mouth of Ice Stream B (the ice plain) and that in the vicinity of Crary Ice Rise are experiencing large and rapid changes. Based on velocity, ice thickness, and accumulation rate data, the patterns of net mass balance in these regions were calculated. Net mass balance, or the rate of ice thickness change, was calculated as the residual of all mass fluxes into and out of subregions (or boxes). Net mass balance provides a measure of the state of health of the ice sheet and clues to the current dynamics. Author (revised)

N93-31889*# Wisconsin Univ., Madison. Geophysical and Polar Research Center.
CHANGES ON THE ICE PLAIN OF ICE STREAM B AND ROSS ICE SHELF Abstract Only
Sion Shabtaie *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 21 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

During the 1970's and 1980's, nearly 200 stations from which accurate, three dimensional position fixes have been obtained from TRANSIT satellites were occupied throughout the Ross Ice Shelf. We have transformed the elevations obtained by satellite altimetry to the same geodetic datum, and then applied a second transformation to reduce the geodetic heights to elevations above mean sea level using the GEM-10C geoidal height. On the IGY Ross Ice Shelf traverse between Oct. 1957 and Feb. 1958, an accurate method of barometric altimetry was used on a loop around the ice shelf that was directly tied to the sea at both ends of the travel route, thus providing absolute elevations. Comparisons of the two sets of data at 32 station pairs on floating ice show a mean difference of 0 +/- 1 m. The elevation data were also compared with theoretical values of elevations for a hydrostatically floating ice shelf. The mean difference between theoretical and measured values of elevations is -2 +/- 1 m.
Author (revised)

N93-31890*# Hughes STX, Inc., Lanham, MD.
SURFACE VELOCITY FIELDS OF ICE STREAMS D AND E DERIVED FROM REPEAT SATELLITE IMAGERY Abstract Only
Ted A. Scambos *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 22 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

Sequential Landsat TM images were used to map in detail the surface velocity of Ice Streams D and E by tracking small ice features in coregistered images. The majority of both ice streams have now been mapped for velocity, and in most areas, approximate strain-rates are also determined. Tracking was accomplished semiautomatically using an image-to-image cross-correlation technique. Measurement density is roughly four per sq km in regions with distinct surface features (crevasses, snow dunes, etc.), and with cloud-free image coverage. Author (revised)

N93-31891*# Saint Olaf Coll., Northfield, MN. Dept. of Physics.
RADAR STUDIES OF THE WEST ANTARCTIC ICE STREAMS Abstract Only
Robert W. Jacobel *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 23 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

A collaboration has carried out measurements of ice thickness at the mouth of Ice Streams D and E, West Antarctica, using a surface-based impulse radar. These studies were undertaken as a part of the continuing effort to understand the state of the West Antarctic Ice Sheet and its response to climate change. Thickness measurements will be used in the mass balance calculation currently in progress and to better understand features in the surface topography seen at low-angle sun illumination in the satellite imagery. Results show that the discharge areas of Ice Streams D and E are thickening by approximately 1 meter per year, and thus that these ice streams are likely losing mass. Aperiodic wavelike features in the surface topography are described, which pose interesting questions

about migration of the grounding line and ice-stream dynamics.
Author (revised)

N93-31892*# Ohio State Univ., Columbus. Polar Research Center.
MASS BALANCE ASSESSMENT USING GPS Abstract Only
Christina L. Hulbe *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 24 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

Mass balance is an integral part of any comprehensive glaciological investigation. Unfortunately, it is hard to determine at remote locations where there is no fixed reference. The Global Positioning System (GPS) offers a solution. Simultaneous GPS observations at a known location and the remote field site, processed differentially, will accurately position the camp site. From there, a monument planted in the firn atop the ice can also be accurately positioned. Change in the monument's vertical position is a direct indicator of ice thickness change. Because the monument is not connected to the ice, its motion is due to both mass balance change and to the settling of firn as it densifies into ice. Observations of relative position change between the monument and anchors at various depths within the firn are used to remove the settling effect. An experiment to test this method has begun at Byrd Station on the West Antarctic Ice Sheet and the first epoch of observations was made. Analysis indicates that positioning errors will be very small. It appears likely that the largest errors involved with this technique will arise from ancillary data needed to determine firn settling. Author (revised)

N93-31893*# Geological Survey, Reston, VA.
RECENT ACCELERATION OF THWAITES GLACIER Abstract Only
J. G. Ferrigno *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 25 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

The first velocity measurements for Thwaites Glacier were made by R. J. Allen in 1977. He compared features of Thwaites Glacier and Iceberg Tongue on aerial photography from 1947 and 1967 with 1972 Landsat images, and measured average annual displacements of 3.7 and 2.3 km/a. Using his photogrammetric experience and taking into consideration the lack of definable features and the poor control in the area, he estimated an average velocity of 2.0 to 2.9 km/a to be more accurate. In 1985, Lindstrom and Tyler also made velocity estimates for Thwaites Glacier. Using Landsat imagery from 1972 and 1983, their estimates of the velocities of 33 points ranged from 2.99 to 4.02 km/a, with an average of 3.6 km/a. The accuracy of their estimates is uncertain, however, because in the absence of fixed control points, they assumed that the velocities of icebergs in the fast ice were uniform. Using additional Landsat imagery in 1984 and 1990, accurate coregistration with the 1972 image was achieved based on fixed rock points. For the period 1972 to 1984, 25 points on the glacier surface ranged in average velocity from 2.47 to 2.76 km/a, with an overall average velocity of 2.62 +/- 0.02 km/a. For the period 1984 to 1990, 101 points ranged in velocity from 2.54 to 3.15 km/a, with an overall average of 2.84 km/a. During both time periods, the velocity pattern showed the same spatial relationship for three longitudinal paths. The 8-percent acceleration in a decade is significant. This recent acceleration may be associated with changes observed in this region since 1986. Fast ice melted and several icebergs calved from the base of the Iceberg Tongue and the terminus of Thwaites Glacier. However, as early as 1972, the Iceberg Tongue had very little contact with the glacier. Author (revised)

N93-31894*# Lamont-Doherty Geological Observatory, Palisades, NY.
AIRBORNE GRAVITY AND OTHER GEOPHYSICAL TECHNIQUES FOR UNDERSTANDING THE LITHOSPHERE BENEATH THE WEST ANTARCTIC ICE SHEET Abstract Only
Robin E. Bell, Donald D. Blankenship (Texas Univ., Austin.), Steven M. Hodge (Geological Survey, Tacoma, WA.), John M. Brozena (Naval Research Lab., Washington, DC.), and John C. Behrendt (Geological Survey, Denver, CO.) *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 26 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

As part of a program entitled Corridor Aerogeophysics of the Southeastern Ross Transect Zone (CASERTZ), an aerogeophysical platform was developed to study the interaction of geological and glaciological processes in West Antarctica. A de Havilland Twin Otter was equipped with an ice-penetrating radar, a proton precession magnetometer, an airborne gravity system, and a laser altimeter. The 60-MHz ice-penetrating radar can recover sub-ice topography with an accuracy of about 10 m through 3 km of comparatively warm West Antarctic ice, while the laser altimeter profiling of the ice surface is accurate to approximately 1 m. The magnetic field observations are accurate to several nT, and the gravity measurements are accurate to better than 3 mGal. The aircraft is navigated by a local radio transponder network, while differential positioning techniques based on the Global Positioning System (GPS) satellites are used for recovering high-resolution horizontal and vertical positions. Attitude information from an inertial navigation system is used to correct the laser altimetry and a digital pressure transducer is used to recover vertical positions and accelerations in the absence of satellite positioning. Continuous base-station observations are made for the differential GPS positioning and the removal of ionospheric noise from the airborne magnetometer measurements.
Author (revised)

N93-31895*# Texas Univ., Austin. Inst. for Geophysics.
AEROGEOPHYSICAL EVIDENCE FOR ACTIVE VOLCANISM BENEATH THE WEST ANTARCTIC ICE SHEET Abstract Only
Donald D. Blankenship, Robin E. Bell (Lamont-Doherty Geological Observatory, Palisades, NY.), Steven M. Hodge (Geological Survey, Tacoma, WA.), John M. Brozena (Naval Research Lab., Washington, DC.), and John C. Behrendt (Geological Survey, Denver, CO.) *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 27 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

Although it is widely understood that the collapse of the West Antarctic Ice Sheet (WAIS) would cause a global sea-level rise of 6 m, there continues to be considerable debate about the response of this ice sheet to climate change. The stability of the WAIS, which is characterized by a bed grounded well below sea level, may depend on geologically controlled conditions at the base, which are independent of climate. Ice streams moving up to 750 m/yr disperse material from the interior through to the oceans. As these ice streams tend to buffer the reservoir of slow-moving inland ice from exposure to oceanic degradation, understanding the ice-streaming process is important for evaluating WAIS stability. There is strong evidence that ice streams slide on a lubricating layer of water-saturated till. Development of this basal layer requires both water and easily eroded sediments. Active lithospheric extension may elevate regional heat flux, increase basal melting, and trigger ice streaming. If a geologically defined boundary with a sharp contrast in geothermal flux exists beneath the WAIS, ice streams may only be capable of operating as a buffer over a restricted region. Should ocean waters penetrate beyond this boundary, the ice-stream buffer would disappear, possibly triggering a collapse of the inland ice reservoir. Aerogeophysical evidence for active volcanism and elevated heat flux beneath the WAIS near the critical region where ice streaming begins is presented. Author (revised)

N93-31896*# Alaska Univ., Fairbanks. Geophysical Inst.
THE ROLE OF THE MARGINS IN ICE STREAM DYNAMICS Abstract Only
Keith Echelmeyer and William Harrison *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 33 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

At first glance, it would appear that the bed of the active ice stream plays a much more important role in the overall force balance than do the margins, especially because the ratio of the half-width to depth for a typical ice stream is large (15:1 to 50:1). On the other hand, recent observations indicate that at least part of the ice stream is underlain by a layer of very weak till (shear strength about 2 kPa), and this weak basal layer would then imply that some or all of the resistive drag is transferred to the margins. In order to address this question, a detailed velocity profile near Upstream B Camp, which extends from the center of the ice stream, across the chaotic shear margin, and onto the Unicorn, which is part of the slow-moving ice sheet was measured. Comparison of this observed velocity profile with finite-element models of flow shows several interesting

features. First, the shear stress at the margin is on the order of 130 kPa, while the mean value along the bed is about 15 kPa. Integration of these stresses along the boundaries indicates that the margins provide 40 to 50 percent, and the bed, 60 to 40 percent of the total resistive drag needed to balance the gravitational driving stress in this region. (The range of values represents calculations for different values of surface slope.) Second, the mean basal stress predicted by the models shows that the entire bed cannot be blanketed by the weak till observed beneath upstream B - instead there must be a distribution of weak till and 'sticky spots' (e.g., 85 percent till and 15 percent sticky spots of resistive stress equal to 100 kPa). If more of the bed were composed of weak till, then the modeled velocity would not match that observed. Third, the ice must exhibit an increasing enhancement factor as the margins are approached (E equals 10 in the chaotic zone), in keeping with laboratory measurements on ice under prolonged shear strain. Also, there is either a narrow zone of somewhat stiffer ice (E equals 5) outward of the shear margin, or the bed is frozen there. And last, the high shear stress and strain rate found at the margin are likely to cause significant viscous heating (q) in the marginal ice. The increase in temperature is proportional to qX/u, where X is the width of the shear zone and u is the transverse velocity component bringing cold ice in from the ice sheet outside the shear zone. Near upstream B, this heating is likely to cause an increase in temperature of 4 to 10 K. Plans are to measure this temperature increase in a series of bore holes near the margin during the 1992-93 field season, as well as to provide a more detailed description of the velocity field there. Author (revised)

N93-31897*# Washington Univ., Seattle. Geophysics Program.
THERMAL CONTROL OF ICE-STREAM MARGINS Abstract Only
Charles F. Raymond *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 34 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

The thermal balance at the base of an ice sheet near an ice-stream margin was investigated theoretically. Specifically, conditions such that the base of the ice sheet would be frozen in the absence of heat generated by the ice motion were investigated. The base of the ice stream is maintained at melting as a result of high dissipation of heat at the base associated with its fast motion over the bed. Heat dissipation in the inter-ice-stream ridge ice is presumed to be too small to maintain melting conditions on the bed there. Two opposing effects can be identified near the shear margin separating the fast and slow motions. Because the velocity of an ice stream falls off toward its margin, there is a near margin heat deficit zone where the heat generated at the bed is not, by itself, sufficient to maintain melting conditions. Without some counteracting process, the base could freeze inward toward the ice stream and cause it to narrow. The marginal shearing generates heat within the ice above the bed. This heat produces a thermal shielding effect that tends to warm the bed on both sides of the boundary between the fast and slow motion. This shielding effect, if strong enough, could produce a thawed zone beyond the fast/slow boundary. If melting at the bed by itself allows fast motion, then the ice stream would be free to widen. A coupled mass and heat flow model is being developed to examine these competing processes. Preliminary calculations using available information for boundary conditions appropriate for Ice Stream B predict that the shielding effect is most important. This tentative result suggests that thermal conditions are such that the ice stream could widen unstably. Other constraints would be required to stabilize the width. Possible factors could be bed morphology beneath ridges that does not allow fast motion even in thawed conditions, or inward advection of cold ice from the ridges across the margin and into the ice stream, which suppresses the shielding effect. The unknown geothermal heat flow beneath ice streams and inter ice-stream ridges is a major uncertainty in doing these calculations. Author (revised)

N93-31898*# California Inst. of Tech., Pasadena. Dept. of Geological and Planetary Sciences.
BASAL HYDRAULIC CONDITIONS OF ICE STREAM B Abstract Only
Hermann Engelhardt and Barclay Kamb *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 35 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

Fifteen boreholes have been drilled to the base of Ice Stream B in the vicinity of UpB Camp. The boreholes are spread over an area of about 500 x 1000 m. Several till cores were retrieved from the bottom of the 1000-m-deep holes. Laboratory tests using a simple shear box revealed a yield strength of basal till of 2 kPa. This agrees well with in-situ measurements using a shear vane. Since the average basal shear stress of Ice Stream B with a surface slope of 0.1 degree is about 20 kPa, the ice stream cannot be supported by till that weak. Additional support for this conclusion comes from the basal water pressure that has been measured in all boreholes as soon as the hot water drill reached bottom. In several boreholes, the water pressure has been continuously monitored; in two of them, over several years. The water pressure varies but stays within 1 bar of flotation where ice overburden pressure and water pressure are equal. The ratio of water and overburden pressure lies between 0.986 and 1.002. This is an extremely high value as compared to other fast-moving ice masses; e.g., Variegated Glacier in surge has a ratio of 0.8, and Columbia Glacier - a fast-moving tidewater glacier - has a ratio of 0.9. It implies that water flow under the glacier occurs in a thin film and not in conduits that would drain away water too rapidly. It also implies that basal sliding must be very effective. Water flow under the glacier was measured in a salt-injection experiment where a salt pulse was released at the bottom of a borehole while 60 m down-glacier, the electrical resistance was measured between two other boreholes. A flow velocity of 7 mm/s was obtained.
Author (revised)

N93-31899*# Pennsylvania State Univ., University Park. Dept. of Geosciences.
IN SEARCH OF ICE-STREAM STICKY SPOTS Abstract Only
Richard B. Alley *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 36 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

The form drag of large bedrock bumps sticking into the base of an ice stream can produce effective 'sticky spots' supporting large basal shear stress. Bedrock regions surrounded by lubricating till at the same topographic level can cause sticky spots, but tend to collect lubricating water and thus are unlikely to support a shear stress of more than a few tenths of a bar unless they contain abundant large bumps. Raised regions on the ice-air surface also can cause moderate increases in the shear stress supported on the bed beneath. Surveys of large-scale bedrock roughness, strain grids across the margins of ice-surface highs, and possibly, water-pressure measurements in regions of thin or zero till would help identify and characterize sticky spots. Author (revised)

N93-31900*# Pennsylvania State Univ., University Park. Dept. of Geosciences.
GEOLOGIC CONTROLS ON THE WEST ANTARCTIC ICE SHEET Abstract Only
Sridhar Anandakrishnan *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 41 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

The stability of the West Antarctic Ice Sheet is intertwined with its geologic history. The sub-ice geology and the possibility of active rifting and associated elevated heat-flux and volcanism might be determining factors in ice-sheet behavior. Seismic monitoring of natural events at the base of Ice Stream C reveals the presence of a young sedimentary basin beneath the ice stream. The sediments are presumed to be of glacio-marine origin, similar to those beneath Ice Stream B and in the Ross Sea. The young sediments are approximately 1/2 km thick at UpC camp, but thin abruptly southward to 100 m or less. We hypothesize the presence of a fault with a throw of 400 m to account for this (though we have not directly detected the fault), rather than invoking unrealistic basement dips. To extend these studies to critical inland regions, we suggest an expanded explosive-source seismic survey of the Byrd Subglacial Basin to determine the extent and character of the hypothesized rift basin. High-resolution seismic monitoring will detect layering in the sedimentary column, as well as possibly imaging faults directly. Author

N93-31901*# Geological Survey, Denver, CO.
EFFECT OF SUBGLACIAL VOLCANISM ON CHANGES IN THE WEST ANTARCTIC ICE SHEET Abstract Only
John C. Behrendt *In* NASA. Goddard Space Flight Center, The First

Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 42 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

Rapid changes in the West Antarctic Ice Sheet (WAIS) may affect future global sea-level changes. Alley and Whillans note that 'the water responsible for separating the glacier from its bed is produced by frictional dissipation and geothermal heat,' but assume that changes in geothermal flux would ordinarily be expected to have slower effects than glaciological parameters. I suggest that episodic subglacial volcanism and geothermal heating may have significantly greater effects on the WAIS than is generally appreciated. The WAIS flows through the active, largely asiesmic West Antarctic rift system (WS), which defines the sub-sea-level bed of the glacier. Various lines of evidence summarized in Behrendt et al. (1991) indicate high heat flow and shallow asthenosphere beneath the extended, weak lithosphere underlying the WS and the WAIS. Behrendt and Cooper suggest a possible synergistic relation between Cenozoic tectonism, episodic mountain uplift and volcanism in the West Antarctic rift system, and the waxing and waning of the Antarctic ice sheet beginning about earliest Oligocene time. A few active volcanoes and late-Cenozoic volcanic rocks are exposed throughout the WS along both flanks, and geophysical data suggest their presence beneath the WAIS. No part of the rift system can be considered inactive. I propose that subglacial volcanic eruptions and ice flow across areas of locally (episodically?) high heat flow--including volcanically active areas--should be considered possibly to have a forcing effect on the thermal regime resulting in increased melting at the base of the ice streams. Derived from text

N93-31902*# Wisconsin Univ., Madison. Dept. of Meteorology.
SENSIBLE AND LATENT HEAT FLUX ESTIMATES IN ANTARCTICA Abstract Only
Charles R. Stearns and George A. Weidner *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 43 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

The assumption has been made that the net annual contribution of water by the processes of deposition and sublimation to the Antarctic Ice Sheet is zero. The U.S. Antarctic Program started installing reliable automatic weather stations on the Antarctic Continent in 1980. The initial units were equipped to measure wind speed, wind direction, air pressure, and air temperature. During the 1983-1984 field season in Antarctica, three units were installed that measured a vertical air temperature difference between the nominal heights of 0.5 m and 3.0 m and relative humidity at a nominal height of 3 m. The measurements of the vertical air temperature difference and the relative humidity are the minimum required to estimate the sensible and latent heat fluxes to the air, while not exceeding the available energy requirements for the weather stations. The estimates of the net annual sublimation and deposition on the Ross Ice Shelf amount to 20 to 80 percent of the annual accumulation. We conclude that the assumption that annual sublimation and deposition are zero is not valid under Antarctic conditions. Author

N93-31903*# Ohio State Univ., Columbus. Polar Research Center.
SURFACE WINDS OVER WEST ANTARCTICA Abstract Only
David Bromwich *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 44 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

Five winter months (April-August 1988) of thermal infrared satellite images were examined to investigate the occurrence of dark (warm) signatures across the Ross Ice Shelf in the Antarctic continent. These features are inferred to be generated by katabatic winds that descend from southern Marie Byrd Land and then blow horizontally across the ice shelf. Significant mass is added to this airstream by katabatic winds blowing from the major glaciers that flow through the Transantarctic Mountains from East Antarctica. These negatively buoyant katabatic winds can reach the northwestern edge of the shelf - a horizontal propagation distance of up to 1,000 km - 14 percent of the time. Where the airstream crosses from the ice shelf to the ice-covered Ross Sea, a prominent coastal polynya is formed. Because the downslope buoyancy force is near zero over the Ross Ice Shelf, the northwestward propagation of the katabatic air mass requires pressure gradient support. The study shows that the extended horizontal propagation of this atmospheric density current occurred in conjunction with the passage of synoptic cyclones over the southern Amundsen Sea. These cyclones can strengthen the pressure gradient in the interior of West Antarctica and make the pressure field favorable for northwestward movement of the katabatic winds from West Antarctica across the ice shelf in a geostrophic direction. The glacier winds from East Antarctica are further accelerated by the synoptic pressure gradient, usually undergo abrupt adjustment beyond the exit to the glacier valley, and merge into the mountain-parallel katabatic air mass. Author

N93-31904*# Maine Univ., Orono. Dept. of Computer Science.
MODELING ICE STREAMS: DERIVED QUANTITIES Abstract Only
James Fastook *In* NASA. Goddard Space Flight Center, The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop Jul. 1993 p 45 (For primary document see N93-31878 12-46)
Avail: CASI HC A01/MF A01

The model addressed is a finite-element, map-plane, time-dependent, column-averaged continuity equation solver. The key to the fitting process involves the balance between ice motion dominated by flow in internal layers, and ice motion dominated by sliding at the bed. The fitting process involves an iterative process carried out in the time domain. Beginning with the portion of the ice sheet being modeled identical to the present ice sheet with uniform flow, sliding, and fraction specified at nominal values, the model monitors each nodal point surface elevation. As the calculated surface elevation deviates from the present surface, a correction proportional to the difference is applied to selected parameter sets. This correction is in a sense that would tend to improve the fit at the particular nodal point. A calculated surface elevation that was higher than the present surface would result in an increased fraction, which would tend to lower the calculated surface (if the flow or sliding constant were being used as the fitting parameter, they would be lowered to improve the fit). This process is allowed to proceed as long as is necessary for the situation to stabilize. Typically, this takes tens of thousands of model years, but the rate is dependent on other external forcings such as the accumulation rate. The primary result is that while a typical sample of ice streams from around Antarctica can be fitted quite reasonably using only the fraction of the velocity due to sliding, a different mechanism seems to be in play along the Siple Coast, where reduced sliding constants are required to attain a reasonable fit. Flow is more strongly channelized in this region, and velocities are, in general, higher than are observed in other regions. It is unlikely that the mechanism that controls the ice movement along the Siple Coast is exactly similar to the mechanisms in the other ice streams. The concept of deformable sediments and their contribution to the fast flow along the Siple Coast may have limited applicability to other Antarctic ice streams. Author (revised)

N93-31996# Texas Univ. at Dallas, Richardson. Center for Space Sciences.
HIGH-LATITUDE ELECTRIC FIELD STUDIES USING DMSP DATA Final Report, 1 Dec. 1989 - 28 Feb. 1993
M. R. Hairston and R. A. Heelis 18 Feb. 1993 50 p
(Contract F19628-90-K-0002)
(AD-A265032; PL-TR-93-2036) Avail: CASI HC A03/MF A01

Analysis using data from the ion drift meter in the SSIES instrument package on the DMSP series of satellites is used to calculate the electrostatic potential distribution in the polar ionosphere. Numerous geophysical parameters such as the location and magnitude of the potential extreme and the classification of the potential distribution as one of the three Heppner-Maynard models can be derived from this data analysis. An earlier version of this analysis procedure (DMSPPOTMOD) is described. This procedure has been expanded into a series of programs under the name DMSPDBASE which generate a database of the ionospheric parameters and results from this analysis. These calculated parameters serve as necessary inputs to the MSFM (Magnetospheric Specification and Forecast Model) used by the Air Weather Service. This report describes each version of the series up to the final version DMSPDBASE4 along with a description of the formats used for the database. New algorithms have been added to the routine in order to improve the selection routine for the endpoints, generalize the Heppner-Maynard model classification algorithm so that it will accommodate any orientation of the satellite track, calculate the true cross polar cap potential drop from the observed potential drop, etc. Analysis results into characterizing the overall potential distribution in both

hemispheres during time of southward IMF and analysis of the evolution of the potential distribution during times of northward IMF are presented. Various collaborations with other users incorporating DMSP data are listed along with presentations and publications which have come from this work. DTIC

N93-31997# Texas Univ., Dallas. Richardson Center for Space Sciences.
STUDIES OF GLOBAL IONOSPHERIC ELECTRODYNAMICS Final Report, 17 Oct. 1989 - 17 Jan. 1993
R. A. Heelis Feb. 1993 24 p
(Contract F19628-90-K-0001)
(AD-A265033; PL-TR-93-2025) Avail: CASI HC A03/MF A01

The distribution of ionospheric plasma in the F layer is intimately related to the electrodynamics of the region. In order to understand many of the morphological features of the plasma, it is necessary to study both the composition and the motion of the plasma both parallel and perpendicular to the magnetic field. At low and middle latitudes we examine various contributions to the electric field, producing plasma motions perpendicular to the magnetic field, and assess their relative importance as functions of latitude and magnetic activity. Understanding the distribution of ion species in the topside equatorial ionosphere also requires consideration of these ion drifts. At higher latitudes, where electric field sources from the inner and outer magnetosphere must be considered, the perpendicular ion drifts can be very large and result in frictional heating of the plasma. This heating produces large scale motion along the magnetic field line that is an inherent part of the plasma circulation in the region. Finally, studies here show that small scale structures in the plasma concentration and electric field at high latitudes are also important in assessing the energy budget and often dominates the electrodynamics of the region. DTIC

N93-32009# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
AN ANALYSIS OF THE COMPOSITION OF AURORAL EMISSIONS IN THE NEAR INFRARED M.S. Thesis
Thomas J. Smith Aug. 1992 98 p
(AD-A265493; AFIT/CI/CIA-92-118) Avail: CASI HC A05/MF A02

This document discusses the history of auroral science and the fundamentals of aurora. Analytical methods include nonlinear least squares method, bland models, NIRS convolver, and error analysis. Atomic emissions and molecular emissions are discussed. DTIC

N93-32068# National Center for Atmospheric Research, Boulder, CO. Research Aviation Facility.
MEASUREMENT UNCERTAINTIES OF THE NCAR AIR MOTION SYSTEMS Technical Note
E. N. Brown Feb. 1993 23 p Sponsored by NSF, Washington, DC
(PB93-184208; NCAR/TN-386+STR) Avail: CASI HC A03/MF A01

An in-depth assessment of the measurement uncertainties of the National Center for Atmospheric Research (NCAR) air motion systems characterizes this capability and is presented as a useful tool for determining wind data quality as it applies to research program specifications and recognizing subtle air data or inertial system malfunctions. An opportunity to compare the aircraft system air motion system with the ground based NOAA Profiler at Medicine Bow, WY provided a limited data set from which the lessons learned will be helpful with future intercomparison planning. At several levels, the wind direction is well within the expected uncertainty and, in general, the Profiler wind speeds are higher by 2-3 m/s than the aircraft system. The directional differences increase as the speed decreases - which is expected from the directional uncertainties. NTIS

N93-32084 Southwest Research Inst., San Antonio, TX.
DIAGNOSTICS OF MAGNETIC SUBSTORMS USING SATELLITE OBSERVATIONS OF MAGNETIC PULSATIONS Final Report, 1 Oct. 1988 - 31 Oct. 1992
Chin S. Lin 26 Oct. 1992 65 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-89-C-0008)
(AD-A264300; SWRI-15-2570; AFOSR-93-0293TR) Avail: CASI HC A04

This project has demonstrated that one class of magnetic pulsations known as stormtime Pc 5 waves is correlated with substorm onsets. Stormtime Pc 5 waves observed by geostationary satellites in the afternoon sector are characterized by oscillations of the magnetic field with a period from 2 to 10 minutes, easily detected by magnetometers on communication or weather satellites. The estimated substorm onset times are found to be within 20 minutes of the actual substorm onset times. Geosynchronous satellites in the afternoon sector would detect these low frequency wave events about 2-4 hours after a substorm onset occurring at local midnight. The delay time depends on the propagation velocity, which varies from a few km/s up to 50 km/s. The disturbed region of a stormtime Pc 5 event has a longitudinal extent varying between 30 and 90 deg. The study shows that stormtime Pc 5 waves have a wave amplitude confined with about 10 deg from the magnetic equator. The propagation velocity is found to increase with wave frequency and with the magnetic field inclination angle. Comparison of the statistical properties of stormtime Pc 5 waves with theoretical calculations of propagation velocity suggests that the propagation velocity of stormtime Pc 5 waves agrees better with the perpendicular group velocity of drift mirror mode. The propagation velocity of stormtime Pc 5 waves appears to be mainly determined by wave parallel wavelength, which is in turn determined by the inclination angle or the magnetic field topology. The obtained results about the propagation properties of magnetic pulsations during storm times is important for the satellite operation since it can be used to predict the plasma environment a synchronous satellite might encounter. DTIC

N93-32087# Texas Water Development Board, Austin. Dept. of Petroleum Engineering.
SHALY SAND FORMATION EVALUATION IN TIGHT GAS SANDS USING ELECTROCHEMICAL POTENTIAL MEASUREMENTS Topical Report, Dec. 1989 - Aug. 1991
M. M. Sharma and M. Jin Aug. 1991 107 p Sponsored by Gas Research Inst., Chicago, IL
(Contract GRI-P9987-0275-S)
(PB93-163186; GRI91/0250) Avail: CASI HC A06/MF A02

Equations are developed that directly relate the shaly conductivity to the electrochemical (membrane) potential (EP). The model is applied to both fully and partially saturated sands. The relationship between the resistivity index and the water saturation is also expressed in terms of a single membrane potential measurement. The Ep measured at different salinities are compared with model prediction using a single membrane potential measurement. Sigma (sub 0) versus Sigma (sub w) curves are then generated using the model equations and compared with measured curves. Experimental results are presented for electrochemical potential measurement made in the lab on 50 tight gs sand samples. It is shown that the measurements can be correlated with CEC although the CEC measured by grinding up the samples was always higher than that estimated from Ep measurements. The Ep measurements are combined with the equations for partial saturation developed in the report to obtain water saturations in a tight gas sand well. Through the example it is shown that it is possible to determine the water saturation in Shaly sands from one membrane potential measurement at a known salinity together with a set of resistivity logs. The results clearly demonstrate the applicability of the method as a practical procedure for Shaly sand information evaluation. NTIS

N93-32094# Boston Univ., MA. Center for Space Physics.
THE EFFECTS OF MAGNETIC STORM PHASES ON F-LAYER IRREGULARITIES FROM AURORAL TO EQUATORIAL LATITUDES Quarterly Report, 1 Jan. - 31 Mar. 1993
Jules Aarons and Michael Mendillo 31 Mar. 1993 4 p
(Contract N00014-89-J-1754)
(AD-A264908) Avail: CASI HC A01/MF A01

Equatorial ionospheric irregularities in the F layer have been the subject of intensive experimental and theoretical investigations during recent years. The class of irregularities which continues to receive much attention is characterized by large scale plasma depletions, generally referred to as ionospheric plumes and bubbles. The F-region nightglow emissions arising from recombination processes can be used to observe the dynamics of transequatorial ionospheric plasma bubbles and smaller scale plasma irregularities. In a collaborative project between the Center for Space Physics of Boston University and the Brazilian Institute for Space Research (INPE), an all-sky imaging system was operated at Cachoeira Paulista (22.7 deg S, 45.0 deg W, dip latitude 15.8 deg S), between Mar. 1987 and Oct. 1991. In addition to the imager, photometer, and VHF polarimeter observations were conducted at Cachoeira Paulista with ionospheric

soundings carried out at C. Paulista and Fortaleza, the latter at 3.9 deg S. 38.4 deg W, dip latitude 3.7 deg S. A VHF electronic polarimeter is in operation at C. Paulista. This long series of OI 630.0 nm imaging observations has permitted us to determine that when there are extended plumes, the altitudes affected over the magnetic equator often exceed 1500 km and probably exceed 2500 km at times, the maximum projection that can be seen from Cachoeira Paulista. This holds true even during years of low solar flux. For this longitude, the observed seasonal variation of the airglow depletions shows a maximum from October through March and a very low occurrence of airglow depletions from April through September. DTIC

N93-32164# Alaska Univ., Fairbanks. Geophysical Inst.
A STUDY OF THE MAGNETIC FIELD ANNIHILATION PROCESS IN THE MAGNETOSPHERE AND SOME GEOTECHNICAL APPLICATIONS
L. C. Lee and S. I. Akasofu 1993 10 p
(Contract DE-FG06-86ER-13530)
(DE93-013172; DOE/ER-13530/3; GI-88-49b) Avail: CASI HC A02/MF A01

The basic plasma processes associated with magnetic reconnection in the Earth's magnetosphere are studied in our proposed project. In the past year, several problems associated with the 2-D and 3-D nonlinear reconnection processes were investigated. A new theory for nonlinear fast steady-state magnetic reconnection is proposed. The inflow region possesses highly curved magnetic field lines, which differs from that in the classical model of Petschek. A separatrix jet of plasma is ejected from the central diffusion region along the magnetic separatrix. Two types of outflow are studied, the simplest one possessing a potential outflow magnetic field and the other containing weak standing shock waves attached to the ends of the diffusion region. Across the separatrix jet, the outflow can be either slowed down by the fast-mode shocks or speeded up by the slow-mode shocks, depending on the downstream boundary conditions. In the 3-D MHD simulations, frayed magnetic flux ropes are found to be formed during the dayside magnetic reconnection process. Strong flux rope-aligned plasma flows are observed. Simulations of the driven reconnection process also indicate that the focusing of the Poynting flux has an important effect on the onset of reconnection and the location of reconnection sites. DOE

N93-32165# Washington Univ., Seattle.
TWO AND THREE DIMENSIONAL MAGNETOTELLURIC INVERSION
J. Booker 1993 29 p
(Contract DE-FG06-89ER-14064)
(DE93-013233; DOE/ER-14064/T1) Avail: CASI HC A03/MF A01

Electrical conductivity depends on properties such as the presence of ionic fluids in interconnected pores that are difficult to sense with other remote sensing techniques. Thus improved imaging of underground electrical structure has wide practical importance in exploring for groundwater, mineral and geothermal resources, and in assessing the diffusion of fluids in oil fields and waste sites. Because the electromagnetic inverse problem is fundamentally multi-dimensional, most imaging algorithms saturate available computer power long before they can deal with the complete data set. We have developed an algorithm to directly invert large multi-dimensional data sets that is orders of magnitude faster than competing methods. We have proven that a two-dimensional (2D) version of the algorithm is highly effective for real data and have made substantial progress towards a three-dimensional (3D) version. We are proposing to cure identified shortcomings and substantially expand the utility of the existing 2D program, overcome identified difficulties with extending our method to three-dimensions (3D) and embark on an investigation of related EM imaging techniques which may have the potential for even further increasing resolution. DOE

N93-32176# Los Alamos National Lab., NM.
PROCEEDINGS OF THE FIRST GEOLOGICAL MATERIALS CONSTITUTIVE MODELING WORKSHOP
R. P. Swift, ed. and C. M. Snell, ed. Apr. 1993 303 p Workshop held in Los Alamos, NM, 9-10 Dec. 1992
(Contract W-7405-eng-36)
(DE93-009161; LA-12534-C; CONF-921265) Avail: CASI HC A14/MF A03

A workshop on constitutive modeling of geologic materials was held at Los Alamos National Laboratory on 9-10 Dec. 1992. The workshop was hosted by the Earth and Environmental Sciences Division and the Physics Division at the Laboratory. Its purpose was to provide an overview of our current understanding of the dynamic response of geologic materials under wave loading, to identify the most important gaps in this understanding, and to define promising experimental approaches for filling the gaps. Particular emphasis was placed on material behavior in the hydrodynamic and strength-dominated regimes for buried explosions, with applications to verification and nonproliferation. These proceedings are a compilation of the brief summary papers and associated viewgraphs presented at the workshop, along with commentary on modeling and experimental issues addressed in the roundtable discussion session. The papers are printed as submitted by the authors, but have been retyped for format uniformity. In cases where legibility allowed, the viewgraphs were reduced to half-page size for a more compact document. DOE

N93-32191 Geological Survey, Sacramento, CA. Water Resources Div.
LAND SUBSIDENCE AND PROBLEMS AFFECTING LAND USE AT EDWARDS AIR FORCE BASE AND VICINITY, CALIFORNIA, 1990
James C. Blodgett and J. S. Williams 1992 32 p Prepared in cooperation with Department of the Air Force, Washington, DC Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB93-182236; USGS/WRI-92-4035) Avail: Issuing Activity (National Technical Information Service (NTIS))

Land subsidence in Antelope Valley, which includes Edwards Air Force Base, was first reported in the 1950's; by 1967, about 200 square miles of Antelope Valley were affected by as much as 2 feet of subsidence. The purpose of the report is to present the results to date of recent studies done by the U.S. Geological Survey, in cooperation with the U.S. Department of the Air Force, to determine the cause and areal extent of land subsidence and surface deformation on Rogers Lakebed and vicinity, and the effects of surface deformation on runways used for aircraft landings at Edwards AFB in southern California. Because of the time-related effects of land subsidence, several years of data collection will be needed to establish subsidence trends and evaluate those factors causing land subsidence. Author

N93-32217 Colorado State Univ., Fort Collins.
NUMERICAL MODELLING OF MESOSCALE ATMOSPHERIC DISPERSION, VOLUMES 1 AND 2 Ph.D. Thesis
Michael D. Moran 1992 794 p
Avail: Univ. Microfilms Order No. DA9311393

Mesoscale atmospheric dispersion is more complicated than smaller scale dispersion because the mean wind field can no longer be considered steady or horizontally homogeneous over mesoscale time and space scales. Wind shear also plays a more important role on the mesoscale and horizontal dispersion can be enhanced and even dominated by vertical wind shear through either the simultaneous or delayed interaction of horizontal differential advection and vertical mixing over one or two diurnal periods. The CSU mesoscale atmospheric dispersion modeling system was used to simulate the transport and diffusion of a perfluorocarbon gas for episodic releases made during two North American mesoscale dispersion field experiments, the 1980 Great Plains tracer experiment and the 1983 Cross-Appalachian Tracer Experiment (CAPTEX). Ground-level and elevated tracer concentrations were measured out to distances of 600 km from the source in the first experiment and 1100 km in the second. The physiography of the two experimental domains was quite different, permitting isolation and examination of the roles of terrain forcing and differential advection in mesoscale atmospheric dispersion. Suites of numerical experiments of increasing complexity were carried out for both case studies. The experiments differed in the realism of their representation of both the synoptic-scale flow and the underlying terrain. The Great Plains nocturnal low-level jet played an important role in the first case while temporal changes in the synoptic-scale flow were very significant in the second case. The contributions of differential advection and mesoscale deformation to mesoscale dispersion dominated those of small-scale turbulent diffusion for both cases, and Pasquills delayed-shear-enhancement mechanism for lateral dispersion was found to be particularly important. The first quantitative evaluation of the CSU mesoscale dispersion modeling system with episodic mesoscale dispersion field data was presented. The modeling system showed considerable skill in predicting quantitative tracer-cloud characteristics such as peak concentration, maximum cloud width, arrival time, transit time, and

crosswind integrated exposure. Model predictions also compared favorably with predictions made by a number of other mesoscale dispersion models for the same two case studies. Dissert. Abstr.

N93-32231*# New Orleans Univ., LA. Dept. of Physics.
DETERMINATION OF DESIGN AND OPERATION PARAMETERS FOR UPPER ATMOSPHERIC RESEARCH INSTRUMENTATION TO YIELD OPTIMUM RESOLUTION WITH DECONVOLUTION, APPENDIX 3
George E. Ioup and Juliette W. Ioup Jul. 1989 79 p
(Grant NAG1-804)
(NASA-CR-192835; NAS 1.26:192835) Avail: CASI HC A05/MF A01

The Always-Convergent Iterative Noise Removal and Deconvolution Method of Ioup is applied as a single-filter in the transform domain to deconvolution with both narrow and wide Gaussian impulse response functions. The wraparound error for both cases is also studied. A method is developed by which one can find the optimum iteration number for single-filter iterative deconvolution of sampled data. The method employs the mean square error (MSE), the square of the difference between the deconvolved result and the input, for optimization. The MSE decreases as the deconvolution iterations proceed, but at the optimum iteration number, the MSE starts to increase. This procedure is repeated for signal-to-noise ratio of 10 to 150. The optimum iteration number and the MSE are plotted vs SNR. By knowing the SNR for a particular experiment, one can find the optimum iteration number and MSE. Author (revised)

N93-32295# Lawrence Livermore National Lab., CA.
INTEGRATION OF MEASUREMENTS WITH ATMOSPHERIC DISPERSION MODELS: SOURCE TERM ESTIMATION FOR DISPERSAL OF (239)Pu DUE TO NON-NUCLEAR DETONATION OF HIGH EXPLOSIVE
L. L. Edwards, T. F. Harvey, R. P. Freis, S. E. Pitovranov (Institute for System Studies, Moscow, USSR.), and E. V. Chernokozhin (Institute of Experimental Meteorology, Obninsk, USSR.) Oct. 1992 8 p Presented at the 3rd International Workshop on Real-Time Computing of the Environmental Consequences of an Accidental Release to Atmosphere from a Nuclear Installation, Schloss Elmau, Bavaria, 25-30 Oct. 1992
(Contract W-7405-eng-48)
(DE93-012550; UCRL-JC-110844; CONF-921040-1) Avail: CASI HC A02/MF A01

The accuracy associated with assessing the environmental consequences of an accidental release of radioactivity is highly dependent on our knowledge of the source term characteristics and, in the case when the radioactivity is condensed on particles, the particle size distribution, all of which are generally poorly known. This paper reports on the development of a numerical technique that integrates the radiological measurements with atmospheric dispersion modeling. This results in a more accurate particle-size distribution and particle injection height estimation when compared with measurements of high explosive dispersal of (239)Pu. The estimation model is based on a non-linear least squares regression scheme coupled with the ARAC three-dimensional atmospheric dispersion models. The viability of the approach is evaluated by estimation of ADPIC model input parameters such as the ADPIC particle size mean aerodynamic diameter, the geometric standard deviation, and largest size. Additionally we estimate an optimal 'coupling coefficient' between the particles and an explosive cloud rise model. The experimental data are taken from the Clean Slate 1 field experiment conducted during 1963 at the Tonopah Test Range in Nevada. The regression technique optimizes the agreement between the measured and model predicted concentrations of (239)Pu by varying the model input parameters within their respective ranges of uncertainties. The technique generally estimated the measured concentrations within a factor of 1.5, with the worst estimate being within a factor of 5, very good in view of the complexity of the concentration measurements, the uncertainties associated with the meteorological data, and the limitations of the models. The best fit also suggest a smaller mean diameter and a smaller geometric standard deviation on the particle size as well as a slightly weaker particle to cloud coupling than previously reported. DOE

N93-32297# Lawrence Livermore National Lab., CA.
COUPLED OCEAN-ATMOSPHERE GCM SIMULATION OF SOUTHERN OSCILLATION PHENOMENA
K. R. Sperber and S. Hameed (State Univ. of New York, Stony Brook.) Jul. 1992 5 p Presented at the 7th Brazilian Meteorological Congress, Sao Paulo, Brazil, 28 Sep. - 2 Oct. 1992
(Contract W-7405-eng-48)
(DE93-012583; UCRL-JC-109822; CONF-9209331-2) Avail: CASI HC A01/MF A01

The Oregon State University coupled upper ocean-atmosphere GCM has been shown to qualitatively simulate the Southern Oscillation. A composite analysis of the warm and cold events simulated in this 23-year integration has been performed. During the low phase of the SO, when warm anomalies occur in the Eastern Pacific the model simulates for the Atlantic region during March-May: (1) a deficit of precipitation over the tropical South American continent; (2) Caribbean and Gulf of Mexico sea-level pressure and sea-surface temperature are in-phase with the Eastern Pacific anomalies, while those East of the Nordeste region are out-of-phase; and (3) northeast trade winds are anomalously weak and southwest trade winds are anomalously strong (as inferred from surface current anomalies). During the high phase of the simulated Southern Oscillation conditions in the atmosphere and ocean are essentially the reverse of the low phase. Thus the model produces a response in the South American region during the opposing phases of the Southern Oscillation which is in general agreement with observations. DOE

N93-32349*# Alabama Univ., Huntsville. Research Inst.
REFINE RESEARCH PLAN FOR USE OF ATLAS DATA Final Report
Michael Newchurch 7 Aug. 1993 6 p
(Contract NAS8-36955)
(NASA-CR-192611; NAS 1.26:192611; UAH-5-32979) Avail: CASI HC A02/MF A01

This contract is devoted to performing atmospheric photochemical modeling research in conjunction with the ATLAS mission. Author

N93-31680*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
DISTINCT ION POPULATION IN THE POLAR CUSP: POSSIBLE SIGNATURE OF TRANSIENT RECONNECTION
C. P. Escoubet (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands.), M. F. Smith, and J. M. Bosqued (Centre d'Etude Spatiale des Rayonnements, Toulouse, France.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 43-48 Sponsored in part by CNES, and ESA (For primary document see N93-31674 12-90)
(Contract NAGw-1638; NAS5-31207)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N93-31182 Colorado Univ., Boulder. Dept. of Astrophysical Planetary and Atmospheric Sciences.
U.S. NATIONAL WEATHER EXPERIMENT STORM-FEST 1992: WAVE AND TURBULENCE IN FRONTAL ZONES Annual Interim Report, 1 Jan. - 1 Dec. 1992
William Blumen 1 Dec. 1992 3 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-92-J-0137)
(AD-A264294; Rept-1533136; AFOSR-93-0239TR) Avail: CASI HC A01

A high density of surface and upper air observations, including aircraft observations, were accumulated during the STORM-FEST Experiment in the central United States (1 Feb. - 13 Mar. 1992). These data are being analyzed to identify the significant internal gravity wave and turbulence activity that occurs in association with low-level frontal passages. The principal analysis method is local decomposition using wavelets as basis functions. These functions provide information on both scale and translation of coherent events, and they are well-suited for frontal analyses. Dissipation of kinetic energy in frontal zones will be determined using data obtained during STORM-FEST. This information will be used in conjunction with theoretical modeling of the frontal scale contraction process that is currently poorly understood. DTIC

N93-31195# Naval Postgraduate School, Monterey, CA.
ADVANCES IN DYNAMICAL PREDICTIONS AND MODELLING OF TROPICAL CYCLONE MOTION Interim Report, Oct. 1992 - Mar. 1993
Russell L. Elsberry Mar. 1993 133 p
(AD-A264500; NPS-MR-93-003; NPS-MR-93-002) Avail: CASI HC A07/MF A02

Recent advances in the use of numerical models for dynamical track predictions and modelling of tropical cyclone motion are reviewed. New applications of barotropic models for operational track predictions are described first. Barotropic models continue to be used by researchers to illustrate the importance of the symmetric and asymmetric components of the initial vortex in the model. New numerical techniques such as adaptive grids are shown to be well suited to the tropical cyclone prediction problem. New data assimilation techniques are first being tested with barotropic models in an effort to improve the initial conditions for track predictions. Selected baroclinic models on limited regions are described in terms of numerical characteristics, representations of physical processes and specifications of the initial conditions. Improvements in these operational limited-region models have yielded more accurate track predictions, and the future goals are to predict the tropical cyclone-related precipitation and the trends in the intensity as well. Recent results from research versions of limited-region baroclinic models appear to promise future improvements in all three aspects, and especially in the specifications of the initial conditions. DTIC

N93-31202# National Oceanic and Atmospheric Administration, Boulder, CO. Forecast Systems Lab.
PRELIMINARY EVALUATION OF AVIATION-IMPACT VARIABLES DERIVED FROM NUMERICAL MODELS
M. M. Cairns, R. J. Miller, S. C. Albers, D. L. Birkenheuer, and B. D. Jamison Apr. 1993 180 p
(PB93-190197; NOAA-TM-ERL-FSL-5) Avail: CASI HC A09/MF A02

The report describes the Aviation Division's Verification Program, located in the Forecast Systems Laboratory, and the results of the first evaluation of four analysis and forecast model systems. The impetus for the evaluation is to get baseline statistics of forecasts of aviation-impact variables (AIVs; e.g., clouds and visibility), which are commonly not forecast or verified in numerical weather prediction models. The results of the study are very preliminary. They are intended to serve as a baseline for future evaluations, not as judgments about the current model capabilities. In general, it was found that all systems produced good analyses and forecasts of state-of-the-atmosphere variables (SAVs) in all areas, except that the surface winds were too strong and wind directions were commonly 30 degrees off. Also, all models were too dry. For AIVs, detection was good for ceiling, visibility, and cloud amount, but the ability to distinguish categories (e.g., scattered or broken clouds) was poor. NTIS

N93-31206# New Hampshire Univ., Durham. Water Resources Research Center.
CHEMISTRY AND ACIDITY OF CLOUD WATER AT MOUNT WASHINGTON, NH Technical Completion Reort
B. W. Mosher Jun. 1992 39 p
(Contracts DI-14-08-0001-G1576; DI-14-08-0001-G1436)
(PB93-190684; Rept-55) Avail: CASI HC A03/MF A01

Cloud water and mixed wet deposition samples were collected at the summit of Mount Washington during the summer months of 1987, 1988 and 1989. Cloud water deposition measurements were also conducted in a balsam fir krummholz community on the west slope of Mt. Washington from July to September, 1988. Acidity, major ion chemistry and organic acid analyses were conducted on cloud water and precipitation samples collected at the summit. Cloud water pH levels as low as 2.7 were recorded. It was found that vegetation at this high elevation site may be exposed to very acidic cloud water (pH2.7-3.5) deposition for continuous periods as long as 14 hours. The acidity and ionic content of cloud water samples was typically observed to be substantially greater than that of attendant rain. The pH of cloud water samples varied from 2.7-6.4. The high pH, low acidity samples were typically collected under conditions where orographic clouds formed close to the summit as air swept up the mountain and cooled, resulting in condensation and cloud formation. The SO4/NO3 ratio of cloud water changes drastically over short time periods. NTIS

N93-31329# National Weather Service, Bohemia, NY. Eastern Region.
THE 3RD NATIONAL HEAVY PRECIPITATION WORKSHOP
J. S. Waldstreicher Apr. 1993 405 p Workshop held in Pittsburgh, PA, 16-20 Nov. 1992
(PB93-186625; NOAA-TM-NWS-ER-87) Avail: CASI HC A18/MF A04

From November 16-20, 1992, the National Weather Service (NWS) held the Third National Heavy Precipitation Workshop at the Pittsburgh Airport Marriott Hotel in Coraopolis, PA. The conference was attended by about 120 individuals representing both the public and private sectors, and the operational and research communities. Other participants included various users of heavy precipitation forecasts, as well as personnel from federal, state, and local emergency management agencies, and three visiting scientists from the People's Republic of China. All told, 27 lectures, 29 posters, 5 different 'hands-on' workshops, and a panel discussion were presented during the course of the week. The meeting proved to be an excellent forum for the discussion of issues and concerns related to the improved prediction of precipitation. NTIS

N93-31600 Royal Netherlands Meteorological Inst., De Bilt.
EXPERIMENTAL EVALUATION OF AN ARRIVAL TIME DIFFERENCE LIGHTNING POSITIONING SYSTEM
H. R. A. Wessels 1992 29 p
(KNMI-WR-92-01; ISBN-9-03-692017-5; ETN-93-93924) Copyright Avail: Issuing Activity (Royal Netherlands Meteorological Institute, P.O. Box 201, 3730 AE De Bilt, Wilhelminalaan 10, Netherlands)

Results from a five station LPATS (Lightning Positioning And Tracking System) covering the Netherlands are analyzed and compared with observer reports and with registrations from lightning counters. It is demonstrated that the median location accuracy of individual flashes is about 2 km. The reliability of detection is diminished by the occurrence of false alarms and the possibility of system saturation during widespread thunderstorms. Contrary to expectations, the system may respond to intracloud discharges. Despite these difficulties the system seems quite acceptable to replace the even more imperfect human observations for warning purposes and for thunderstorm statistics. In addition, the system offers possibilities to collect statistics of lightning parameters like peak currents and lightning discharge density. A preliminary statistical analysis shows that the establishment of preferred lightning subregions in the Netherlands would require at least ten years of measurements, while small scale so called lightning spots will remain masked by the limited location accuracy. ESA

N93-31601 Royal Netherlands Meteorological Inst., De Bilt. Werkgroep Klimaatscenario's.
GCM CONTROL RUN OF UK METEOROLOGICAL OFFICE COMPARED WITH THE REAL CLIMATE IN THE NW EUROPEAN WINTER
J. J. Beersma Jun. 1992 38 p
(KNMI-WR-92-02; ISBN-9-03-692021-3; ETN-93-93925) Copyright Avail: Issuing Activity (Royal Netherlands Meteorological Institute, P.O. Box 201, 3730 AE De Bilt, Wilhelminalaan 10, Netherlands)

A method to compare the statistical properties of surface air temperature, sea surface temperature, precipitation, global radiation, 500 mbar height, sea level pressure, and wind generated by a General Circulation Model (GCM) with those of observations is presented. As an illustration the control run of a UKMO (United Kingdom Meteorological Office) 11 layer GCM for five successive winters (Dec., Jan., Feb.) is compared with observations for North West (NW) Europe. In this comparison large differences are found in (monthly) mean values, standard deviations, and autocorrelation coefficients for various elements. In general, this GCM winter run creates too low temperatures over land, too high temperatures over sea, large temperature variability but small pressure variability and too small autocorrelation coefficients for time lags of more than three days. Too many wet days are created with too little precipitation. The 500 mbar circulation is veered with respect to reality and shows a peculiar trough over the North Sea. The wind at 100 m is backed and the geostrophic wind is somewhat underestimated. No physically realistic transition of the surface temperature from land to sea is observed. These results suggest that care has to be taken in interpreting direct model output on a regional scale such as NW Europe. Given the limitations of this study, the relatively short GCM run and difficulties related to comparing GCM grid points with station observations, further work along these lines is desirable, preferably on the basis of the output of more recent GCM versions. ESA

N93-31871# World Wildlife Fund, Inc., Washington, DC.
CENTRAL AFRICA: GLOBAL CLIMATE CHANGE AND DEVELOPMENT
1992 29 p Sponsored by AID, Washington, DC Prepared in cooperation with Nature Conservancy, Arlington, VA, and World Resources Inst., Washington, DC
(Contract AID-DHR-5554-A-00-8044-03)
(PB93-179612; AID-PN-ABL-401) Avail: CASI HC A03/MF A01

Central Africa contains the largest remaining contiguous expanse of moist tropical forest on the African continent and the second largest in the world. However, deforestation rates are rising as the result of rapid population growth, inappropriate economic policies, economic downturns, and weak management capacities. If clearing rates continue to rise, a substantial amount of carbon dioxide will be released into the atmosphere, thus contributing to global climate change. The report summarizes a study designed as a first step in understanding the complex dynamics of the causes and effects of global climate change in Central Africa. The current state of the region's forests, greenhouse gas emissions from deforestation and biomass burning, and the potential impacts of global climate change are discussed. NTIS

N93-31874# National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
MEAN SEASONAL CYCLES AND INTERANNUAL VARIATIONS AT 0 DEG, 165 DEG E DURING 1986-1992
M. E. McCarty and M. J. McPhaden Mar. 1993 70 p See also PB92-143080 and PB93-114726 Prepared in cooperation with Joint Inst. for the Study of the Atmosphere and Ocean, Seattle, WA
(PB93-186195; NOAA-TM-ERL-PMEL-98; CONTRIB-1431) Avail: CASI HC A04/MF A01

The report summarizes current meter mooring data at 0 deg, 165 deg E in terms of multi-year monthly mean time series and mean seasonal cycles. Data span the years 1986-1992. The measurements consist of surface winds, air temperatures, ocean currents in the upper 300 m, and ocean temperatures in the upper 500 m. Supplemental wind data are included from Nauru (0 deg 32 min S, 166 deg 54 min E) for the same time period. NTIS

N93-31922# Naval Research Lab., Monterey, CA.
NAVY TACTICAL APPLICATIONS GUIDE, PART 2, VOLUME 8: ARCTIC-EAST SIBERIAN/CHUKCHI/BEAUFORT SEAS. WEATHER ANALYSIS AND FORECAST APPLICATIONS Final Report, Jan. 1989 - Jun. 1991
Robert W. Fett and Thomas L. Kozo Dec. 1992 389 p
(DA Proj. X15-96)
(AD-A265585; NRL/PU/7541-92-0005-Pt-2-Vol-8) Avail: CASI HC A17/MF A04

Environmentally, the north polar region is one of the most active regions on Earth, and for ships and seamen, one of the most dangerous due to the combined effects of wind, sea state, and structural icing. It is also the region most neglected and difficult to analyze or forecast because of the sparsity of surface, upper air, and ocean observations, and less than adequate numerical models. This volume illustrates, with high resolution satellite data and supplementary conventional surface and upper air analyses, some of the significant recurring patterns of weather and oceanographic phenomena in the Arctic. This volume is dedicated to weather and oceanographic phenomena in the regions surrounding northern Alaska and northern Siberia (Part 1 covered the Norwegian Sea, Barents Sea, and Greenland). Its purpose is to document Arctic weather phenomena as observed by satellite, and in doing so, assist meteorologists in the development of satellite interpretation skills. DTIC

N93-32005# Naval Research Lab., Monterey, CA.
TROPICAL CYCLONE FORECASTERS REFERENCE GUIDE, NO. 3: TROPICAL CYCLONE FORMATION Final Report
Richard A. Jeffries and Ronald J. Miller Apr. 1993 45 p
(AD-A265216; NRL/PU/7515-93-0007) Avail: CASI HC A03/MF A01

One of the keys to safe and successful naval operations in the tropics is a thorough understanding of tropical meteorology. The Tropical Cyclone Reference Guide is designed primarily as a ready reference for midlatitude forecasters required to provide tropical meteorology support to staff commanders. This report presents a comprehensive overview of tropical cyclone genesis forecast support and is chapter 3 of the reference guide. Subjects discussed include tropical cyclone genesis forecast products, major warning center operations, tropical cyclone genesis terminology, and significant ranges of tropical cyclone genesis phenomena by basin that could be encountered in the world marine environment. DTIC

N93-32008# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
DETERMINATION OF THE ROBUSTNESS OF PASSIVE MICROWAVE MEASUREMENTS AND DERIVATIVE PARAMETERS FOR USE IN PRECIPITATION DISCRIMINATION OVER LAND M.S. Thesis
John S. Shattuck 1992 101 p
(AD-A265492; AFIT/CI/CIA-92-121) Avail: CASI HC A06/MF A02

In this study, a large set of microwave and infrared parameters, derived from the Special Sensor Microwave/Imager (SSM/I) and the Indian Geosynchronous Satellite (INSAT), are examined to qualitatively determine how much contrast exists between raining and non-raining conditions over land. The precipitation regime of the Indian summer monsoon was chosen for the evaluation testbed. Each of the microwave parameters contain measurements which were enhanced, through a deconvolution technique, to match the spatial resolution of the 85 GHz channel (15 x 13 km). The microwave and infrared measurements are grouped into Probability Distribution Functions (PDFs) and Cumulative Distribution Functions (CDFs) containing one week of measurements for each parameter and time of satellite measurement within a Indian subdivision. The mean and standard deviation of each PDF and the slope and intercept factors of each CDF are tested for robustness against weekly subdivisional raingage data. DTIC

N93-32043# Florida State Univ., Tallahassee.
THERMODYNAMIC STRUCTURE OF SUBSIDENCE INVERSIONS IN THE ATLANTIC SUBTROPICAL ANTICYCLONE REGIME M.S. Thesis
Mark B. Miller 1992 87 p
(AD-A265406; AFIT/CI/CIA-92-116) Avail: CASI HC A05/MF A01

Data obtained from the eastern Atlantic Ocean for June 1980-1990 were examined to determine the mean thermodynamic structure of the boundary layer, subsidence inversion layer, and free atmosphere above the subsidence inversion layer along the eastern periphery of the Atlantic subtropical anticyclone. Moist intrusions in the free atmosphere above the subsidence inversion were found to exist in many cases. Differences in the thermodynamic structure were found between soundings with and without the moist layer present above the subsidence inversion. The moist layer itself was discussed and possible sources for the moisture were examined. DTIC

N93-32051# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
WIND PROFILING IN A CLOUDY CONVECTIVE ATMOSPHERIC BOUNDARY LAYER OVER LAND M.S. Thesis
David A. Valler, Jr. Dec. 1992 101 p
(AD-A265422; AFIT/CI/CIA-92-113) Avail: CASI HC A06/MF A02

The vertical velocity structure of a cloud-topped atmospheric boundary layer, over land, was evaluated using high temporal vertical velocity measurements from two UHF clear-air Doppler radars (wind Profilers) on 20 March 1991 and 31 January 1992, located at Penn State's Circleville Farm site. On both dates, post-cold-frontal stratocumulus covered the area. A transition from a cloudy convective boundary layer to a clear convective boundary layer occurred on 20 March 1991. Vertical velocities were measured, at 30-second intervals, using the vertical beam of the profilers. Vertical velocities were averaged over hourly periods. Vertical velocity variance, Signal-to-Noise Ratio (SNR), and SNR variance were also evaluated for each hourly period. DTIC

N93-32063# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
EVOLUTION OF AREA-AVERAGED VERTICAL VELOCITY IN THE CONVECTIVE REGION OF A MIDLATITUDE SQUALL LINE M.S. Thesis
Dennis A. Hobson Dec. 1992 133 p
(AD-A265333; AFIT/CI/CIA-92-122) Avail: CASI HC A07/MF A02

The evolution of area-averaged vertical velocity over a 50 km length segment of the convective region of the 10 - 11 June 1985 squall line system observed during PRESTORM (Preliminary Regional Experiment for Stormscale Operational and Research Meteorology - Central Phase) was examined over a period of 43 minutes during the storm's mature stage. Seven dual-Doppler analyses with a temporal resolution of 6-10 minutes were used to determine vertical velocity. The vertical velocity was then

sampled within the boundaries of an objectively defined convective region; delineated by low and mid-level thresholds of reflectivity and reflectivity gradient. Variations in area-averaged vertical velocity profiles suggested significant mesoscale evolution of the convective region over the period of analysis. This notion was supported by examination of area-averaged reflectivity profiles, and the distribution of vertical velocity magnitudes as a function of height, as well as cross-sections of vertical velocity, reflectivity, and storm-relative flow fields. Comparison of the observed changes in the convective drafts, reflectivity structure, and storm-relative flow, with those of numerical simulations of squall line evolution suggested that the convective region had undergone a rather quick transition from a stronger, developing state to a much weaker, mature state. DTIC

N93-32171 Scripps Institution of Oceanography, La Jolla, CA. Marine Physical Lab.

UPGRADE OF THE LIMDAS DAY/NIGHT WHOLE SKY IMAGER Final Report, 1 Apr. 1992 - 31 Mar. 1993

Kenneth M. Watson May 1993 8 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract N00014-89-D-0142)

(AD-A265871; MPL-U-30/93) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The Whole Sky Imager (WSI) is a ground-based system for assessment of cloud cover over the full upper hemisphere. Using a fish-eye lens and a slow scan CCD sensor, it acquires imagery through daylight, into moonlight and starlight conditions. At the start of this contract, the new Day/Night WSI was in brassboard configuration. This contract funding enabled MPL to complete assembly of the system and field it, and develop supporting software. DTIC

N93-32289# Lamont-Doherty Geological Observatory, Palisades, NY.

RECENT CHANGES OF WEATHER PATTERNS IN NORTH AMERICA

G. J. Kukla and T. Karl (National Climatic Data Center, Asheville, NC.) Apr. 1993 5 p

(Contract DE-FG02-85ER-60372)

(DE93-013982; DOE/ER-60372/8) Avail: CASI HC A01/MF A01

Climate models predict a general increase of surface air temperature and drought frequency in parts of the North American continent due to increased CO2 concentrations. Regional climate change results in part from the changed frequency of the atmospheric and oceanic circulation patterns in addition to the changed properties of the different air mass types. We are investigating the frequency and properties of the air mass types differentiated by moisture dependent variables and comparing the findings to that simulated by numerical climate models. The objectives of this project are to analyze the time related changes and variability in the properties and frequency of air masses and weather extremes over North America and to determine the degree to which the observed changes agree with climate model predictions. DOE

48 OCEANOGRAPHY

Includes biological, dynamic, and physical oceanography; and marine resources.

For related information see also *43 Earth Resources and Remote Sensing.*

N93-31082# Princeton Univ., NJ.

MODELING STUDIES OF ICE-OCEAN DYNAMICS AND THERMODYNAMICS Final Technical Report

George L. Mellor 10 Mar. 1993 7 p

(Contract N00014-90-J-1268)

(AD-A264084) Avail: CASI HC A02/MF A01

These papers were mainly concerned with the development of an ice model and the coupling of the model to the (now standard) Princeton ocean model. The studies were largely based on either one-dimensional, time dependent model or two-dimensional (x,z) models. The latter included a model study of atmospheric-ice interactions. DTIC

N93-31333# National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.

TOTAL CO2 AND NITRATE MEASUREMENTS IN THE SOUTHWEST PACIFIC DURING AUSTRAL AUTUMN, 1990 Data Report

M. F. Lamb, R. A. Feely, L. Moore, and D. K. Atwood Mar. 1993 68 p

(PB93-188415; NOAA-DR-ERL-PMEL-42) Avail: CASI HC A04/MF A01

During austral autumn of 1990 total CO2 and nitrate measurements were made in the South Pacific as part of the Climate and Global Change Program. Data were collected during two legs; sampling for Leg 1 began along 170 deg W from 15 deg S to 60 deg S, then angled northwest toward New Zealand across the Western Boundary Current. Leg 2 included a reoccupation of some stations between 30 deg S and 15 deg S on 170 deg W, and measurements from 15 deg S to 5 deg N along 170 deg W. Ancillary measurements of salinity were also taken. Descriptions of sampling and methods and data summaries are given in the report. NTIS

N93-31497# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

TIDALLY AVERAGED MODELS FOR DISPERSION IN SHALLOW WATER

A. W. Heemink 1992 39 p

(Rept-92-66; ETN-93-94258) Copyright Avail: CASI HC A03/MF A01

The advection and diffusion of contaminants in tidal waters are addressed. The analysis starts with the well known vertically integrated advection-diffusion equation. In order to derive a tidally averaged model to describe the advection and dispersion processes over long periods and to gain insight into the tidally induced dispersion, a method to average the tide is introduced. Here it is assumed that both the dispersion coefficient and the residual flow are sufficiently small. The averaging procedure is derived by using a random walk model to describe the dispersion process. This random walk model is shown to be exactly consistent with the advection-diffusion equation. The averaging procedure results in equations for the averaged advective transport as well as equations for the effective dispersion tensor describing the mixing process that occurs within one tidal cycle. By using a numerical model to determine the tidal movement over one tidal cycle, the tidally averaged advective transport and dispersion tensor in each grid point of the model is approximated numerically. In this way a tidally induced dispersion map of the area under study is obtained. ESA

N93-31591 National Marine Fisheries Service, Narragansett, RI. Northeast Fisheries Science Center.

VARIABILITY OF TEMPERATURE AND SALINITY IN THE MIDDLE ATLANTIC BIGHT AND GULF OF MAINE

R. L. Benway, J. W. Jossi, K. P. Thomas, and J. R. Goulet Apr. 1993 114 p See also PB85-173698 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(PB93-174019; NOAA-TR-NMFS-112; MARMAP-ATLAS-MONO-4) Avail: Issuing Activity (National Technical Information Service (NTIS))

There has been a growing scientific concern about the influence of climatic change on marine ecosystems. Oceanic factors, such as water temperature and salinity, have been shown to be of prime importance to resident and transient biota, because of direct and indirect environmental influences upon physiological processes such as metabolic rates and reproductive cycles. Monitoring of the waters of the Middle Atlantic Bight and Gulf of Maine has been conducted by the MARMAP Ships of Opportunity Program since the early 1970's. Presented in the atlas are portrayals of the temporal and spatial patterns of surface and bottom temperature and surface salinity for these areas during the period 1978-1990. These patterns are shown in the form of time-space diagrams for single-year and multi-year (base period) time frames. Each base period figure shows thirteen-year (1978-1990) mean conditions, sample variance in the form of standard deviations of the measured values, and data locations. Each single-year figure displays annual conditions, sampling locations, and departures of annual conditions from the thirteen-year means, expressed as algebraic anomalies and standardized anomalies. NTIS

N93-31815# National Oceanic and Atmospheric Administration, Boulder, CO. Wave Propagation Lab.

THEORY AND APPLICATION OF A RADIO-ACOUSTIC SOUNDING SYSTEM (RASS)

R. J. Lataitis 1993 215 p
(PB93-191252; NOAA-TM-ERL-WPL-230) Avail: CASI HC A10/MF A03

The speed of sound in air is proportional to the square root of the virtual temperature. A conventional Doppler wind-profiler radar can measure the speed of a sound wave, emitted from a nearby acoustic source, at various heights, from which a virtual temperature profile can be inferred. The report examines the effect of various environmental factors on the performance of such a Radio-Acoustic Sounding System (RASS). NTIS

N93-31832 National Oceanic and Atmospheric Administration, Miami, FL. Oceanographic and Meteorological Labs.
HYDROGRAPHIC OBSERVATIONS IN THE WESTERN TROPICAL AND SUBTROPICAL NORTH ATLANTIC OCEAN: ATLANTIC CLIMATE CHANGE PROGRAM (ACCP) AND WESTERN TROPICAL ATLANTIC EXPERIMENT (WESTRAX) DURING 1991 Data Report
E. Johns and A. M. Wilburn Mar. 1993 88 p See also PB93-184760 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB93-184778; NOAA-DR-ERL-AOML-23) Avail: CASI HC A05

Data collected during the 1991 Atlantic Climate Change Program and the Western Tropical Atlantic Experiment were presented. The goals of the programs were to increase the understanding of the roles of regional circulation and ocean circulation in global climate. Salinity, ocean temperature as a function depth and other hydrographic data were collected from shipborne platforms. NTIS

N93-31859*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
SeaWiFS TECHNICAL REPORT SERIES. VOLUME 10: MODELING OF THE SeaWiFS SOLAR AND LUNAR OBSERVATIONS
Robert H. Woodward (General Sciences Corp., Laurel, MD.), Robert A. Barnes (Chemal, Inc., Wallops Island, VA.), Charles R. McClain, Wayne E. Esaias, William L. Barnes, Ann T. Mecherikunnel, Stanford B. Hooker, ed., and Elaine R. Firestone, ed. Washington May 1993 29 p
(NASA-TM-104566-Vol-10; NAS 1.15:104566-Vol-10; Rept-93B00085)
Avail: CASI HC A03/MF A01

Post-launch stability monitoring of the Sea-viewing Wide Field-of-view Sensor (SeaWifs) will include periodic sweeps of both an onboard solar diffuser plate and the moon. The diffuser views will provide short-term checks and the lunar views will monitor long-term trends in the instrument's radiometric stability. Models of the expected sensor response to these observations were created on the SeaWiFS computer at the National Aeronautics and Space Administration's (NASA) Goddard Space Flight Center (GSFC) using the Interactive Data Language (IDL) utility with a graphical user interface (GUI). The solar model uses the area of intersecting circles to simulate the ramping of sensor response while viewing the diffuser. This model is compared with preflight laboratory scans of the solar diffuser. The lunar model reads a high-resolution lunar image as input. The observations of the moon are simulated with a bright target recovery algorithm that includes ramping and ringing functions. Tests using the lunar model indicate that the integrated radiance of the entire lunar surface provides a more stable quantity than the mean of radiances from centralized pixels. The lunar model is compared to ground-based scans by the SeaWiFS instrument of a full moon in December 1992. Quality assurance and trend analyses routines for calibration and for telemetry data are also discussed. Author

N93-31873# Virginia Inst. of Marine Science, Gloucester Point.
BENTHIC STUDY OF THE CONTINENTAL SLOPE OFF CAPE HATTERAS, NORTH CAROLINA. VOLUME 1: EXECUTIVE SUMMARY
R. J. Diaz, J. A. Blake, and D. C. Rhoads Mar. 1993 21 p See also Volume 2, PB93-186070 Sponsored by Minerals Management Service, Herndon, VA Prepared in cooperation with Science Applications International Corp., Woods Hole, MA
(Contract DI-14-35-0001-30672)
(PB93-186062; OCS/MMS-93/0014-Vol-1) Avail: CASI HC A03/MF A01

Because of the potential impact on the environment associated with development and production activities, the Oil Pollution Act of 1990 mandated that a panel of experts, the North Carolina Environmental Sciences Review Panel (NCESRP), be convened. Their purpose was to consider whether the availability of scientific information was adequate for making decisions about oil and gas leasing, exploration, and development off North Carolina. The present study was developed by the Minerals Management Service because of concern raised by the NCESRP (1992) that not more than 5 percent of the unusual benthic community be covered by drill muds and cuttings. The principal task of the study was to determine if the communities extended over an area of the sea floor that was 20 times larger than the area estimated to be covered by drill muds and cuttings. If more than 5 percent of the unusual benthic community were covered by drill muds and cuttings, the NCESRP recommended that a study be carried out to determine the recovery rate of this community. NTIS

N93-31983# Woods Hole Oceanographic Inst., MA.
TIDES OF MASSACHUSETTS AND CAPE COD BAYS
J. D. Irish and Richard P. Signell Sep. 1992 70 p
(AD-A264790; WHOI-92-35) Avail: CASI HC A04/MF A01

The Massachusetts Bays Program made bottom pressure and water velocity observations in Massachusetts and Cape Cod Bays during 1990 and 1991. In the Bays, the sea surface elevation appeared to rise and fall in phase with equal amplitudes at each diurnal or semidiurnal tidal frequency. There is some amplification in Boston and Provincetown harbors. The semidiurnal tides (particularly the M2 constituent) dominate. Massachusetts and Cape Cod Bays are part of the Gulf of Maine/Bay of Fundy system which is resonant near the semidiurnal tidal frequency. This resonance amplifies the importance of the semidiurnal tides so that diurnal and higher harmonic tides become negligible. The sea level tides force currents which move with the same frequencies, but whose amplitudes are affected by the bathymetry. The strongest currents exist in the channel between Race Point and Stellwagen Bank where tidal currents exceed 1 knot. Analysis of current records for their tidal signal is complicated by internal tides which contaminate the records. These internal waves at tidal frequency exist on the stratification in the water column and disappear during winter well-mixed times. At other times, they must be considered as a significant source of energy for mixing and resuspension of sediments. DTIC

N93-32037# Pennsylvania Univ., Philadelphia.
MODELING AND INFERENCE FOR TRANSIENT TRACERS ON OCEANIC FLOW
Michael J. Phelan May 1993 17 p
(Contract N00014-93-1-0216)
(AD-A265428) Avail: CASI HC A03/MF A01

This report surveys recent progress in research on modeling and inference for transient tracers on oceanic flows. The survey covers in some detail the contents of five technical reports on various aspects of this research, including a Markov process for mass transport and estimation functions for estimating flow coefficients, dissipation rates, and birth rates from chronicles of transient tracers. The details include theoretical results of independent interest that support applications to inference from tracer data. DTIC

N93-32075# Naval Postgraduate School, Monterey, CA. Dept. of Oceanography.
A NUMERICAL STUDY OF SEASONAL WIND FORCING EFFECTS ON THE CALIFORNIA CURRENT SYSTEM M.S. Thesis
Ross P. Mitchell and M. L. Batteen Mar. 1993 124 p
(AD-A264951; NPS-OC-93-001) Avail: CASI HC A06/MF A02

A high-resolution, multi-level, primitive equation ocean model is used to examine the response of an idealized, flat-bottomed, eastern boundary oceanic regime on a beta-plane to both steady and seasonally-varying climatological wind forcing. The focus of the study is the California Current System along the coastal region, from 35 deg N to 45 deg N, off the Western United States. With steady equatorward wind forcing, a surface equatorward current and poleward undercurrent develop. Eddies form around days 60 and 70 with initial development in the northern region of the domain. The strong meandering current continues to grow throughout the 360 days of model time and can produce eddies that have wavelengths up to 200 km and can propagate at least 200 km offshore. When the alongshore component of the temporally averaged seasonally varying climatological wind forcing is used, there is a weak poleward undercurrent and equatorward surface current. There is weak upwelling and very little eddy activity with the eddies only propagating to 100 km offshore. When alongshore component of the time-dependent wind forcing with spatial variability in latitude is used, a surface equatorward jet, poleward undercurrent and eddies are generated. The eddies form throughout the domain in this

experiment due to a competition between the beta-plane effect and the continuous and stronger equatorward wind forcing in the southern portion of the domain. The eddies in this experiment propagate at least 150 km from shore. DTIC

N93-32172 Scripps Institution of Oceanography, La Jolla, CA. Marine Physical Lab.
NEAR BOTTOM DATA COLLECTION AND DATA ANALYSIS Final Report, 1 Jul. 1990 - 30 Mar. 1992
W. S. Hodgkiss May 1993 5 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-89-D-0142)
(AD-A265872; MPL-U-25/93) Avail: CASI HC A01

The objective of this program was to assist NOSC in the preparations required to conduct a VLF noise and signal experiment in FY93. Little experimental data exists which can be applied to the design and performance evaluation of multidimensional array systems. Such data are needed both to validate signal and noise propagation models as well as to provide well-documented real data inputs to new adaptive spatial and temporal processing algorithms. DTIC

N93-32190# Virginia Inst. of Marine Science, Gloucester Point.
BENTHIC STUDY OF THE CONTINENTAL SLOPE OFF CAPE HATTERAS, NORTH CAROLINA, VOLUME 2 Final Report
R. J. Diaz, J. A. Blake, and D. P. Lohse Mar. 1993 157 p Color illustrations reproduced in black and white. See also Volume 1, PB93-186062 Sponsored by Minerals Management Service, Herndon, VA Prepared in cooperation with Science Applications International Corp., Woods Hole, MA
(Contract DI-14-35-0001-30672)
(PB93-186070; OCS/MMS-93/0015-Vol-2) Avail: CASI HC A08/MF A02

A number of blocks off Cape Hatteras have been leased by Mobil Oil which has requested permission to drill an exploratory well, at 820-m depth, in a block identified as Manteo 467. The proposed well location is 39 miles from the coast of North Carolina. The possibility of extracting gas from the continental slope off the coast of North Carolina, particularly at slope depths, has raised a number of environmental concerns that cannot be addressed from existing data. The present study was developed by the Minerals Management Service to better define the nature of the continental slope benthic communities off Cape Hatteras and to delineate their areal extent. Emphasis was placed on the area around the proposed drill site in the Manteo 467 lease block. NTIS

N93-32215 California Univ., San Diego.
A STUDY OF CAPILLARY AND CAPILLARY-GRAVITY WIND WAVES: THEIR STRUCTURES, DISTRIBUTIONS, AND ENERGY BALANCES Ph.D. Thesis
Xin Zhang 1992 233 p
Avail: Univ. Microfilms Order No. DA9312118

Wave forms, two dimensional structures, and wavenumber spectra of very short wind waves are studied in a laboratory wind wave tank with an optical detector. In this technique the water surface elevation gradient is encoded by colors so that a camera can record the surface gradient information in two dimensions. As a consequence the shape of the water surface can be reconstructed and wave forms and structures can be examined extensively. Short waves in the capillary range featuring sharp troughs and flat crests are very commonly seen among wind waves though very steep gravity waves are rarely found. Our observations show that most short waves do not have very large slopes. Wave forms that resemble capillary-gravity solitons are observed with a close match to the form theoretically predicted for potential flow. Capillaries are mainly to be found as parasitic capillaries on the forward faces of gravity waves. The longest wavelengths of parasitic capillaries found are less than 1 cm. An important feature of the short wave energy distribution is that widening of the angular spread of spectra is not monotonic with increasing wavenumber. There is a local minimum of angular spreading in the spectral band of parasitic capillaries. There is a characteristic dip at the gravity-capillary transition wavenumber of the energy spectra integrated over all directions and this dip becomes filled in as the wind increases. The spectral cutoff at high wavenumbers shows a power law behavior with an exponent of about minus four. The wavenumber range between transition to cutoff does not vary rapidly with change of wind speed. Dissert. Abstr.

N93-32308# Virginia Inst. of Marine Science, Gloucester Point.
BENTHIC STUDY OF THE CONTINENTAL SLOPE OFF CAPE HATTERAS, NORTH CAROLINA. VOLUME 3: APPENDICES
R. J. Diaz, J. A. Blake, and D. P. Lohse Mar. 1993 127 p Color illustrations reproduced in black and white. See also Volume 2, PB93-186070 Sponsored by Minerals Management Service, Herndon, VA Prepared in cooperation with Science Applications International Corp., Woods Hole, MA
(Contract DI-14-35-0001-30672)
(PB93-186088; OCS/MMS-93/0016-Vol-3) Avail: CASI HC A07/MF A02

'The Point' is an area that supports a most productive pelagic fishery, including tuna, swordfish, marlin, and more. The objective of the study is to analyze video tapes from near 'the Point,' in order to provide data on epibenthic, megafaunal invertebrates including species composition, relative abundances, and large scale (1 km) distribution. 'The Point' is not a defined spot on a chart. Although fishermen do use the steep shelf break for location, they generally look for the west wall of the Gulf Stream. 'The Point' and the oil lease site coincidentally occur where the Gulf Stream parts the continental slope, just north of the eastern-most tip of Cape Hatteras. NTIS

N93-32320# Scripps Institution of Oceanography, La Jolla, CA. Marine Physical Lab.
RESEARCH PLATFORMS FLIP AND ORB SUPPORT Final Report
Kenneth M. Watson and Fred H. Fisher May 1993 6 p
(Contract N00014-89-J-1889)
(AD-A265910; MPL-U-31/93) Avail: CASI HC A02/MF A01

This project provided support for the operation, maintenance, and upgrades of the Research Platforms FLIP and ORB, both of which are operated by the Scripps Institution of Oceanography, University of California, San Diego. These platforms, owned by the U.S. Navy, are used principally in support of ASW research and development projects. Their stability characteristics, instrument deployment capabilities, and mooring capabilities make them unique platforms for obtaining ocean environmental data critical to the successful development of advanced ASW systems. DTIC

N93-32360*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
SeaWiFS TECHNICAL REPORT SERIES. VOLUME 4: AN ANALYSIS OF GAC SAMPLING ALGORITHMS: A CASE STUDY
Charles R. McClain, Eueng-Nan Yeh (General Sciences Corp., Laurel, MD.), Gary Fu (General Sciences Corp., Laurel, MD.), Stanford B. Hooker, ed., and Elaine R. Firestone, ed. (General Sciences Corp., Laurel, MD.) Washington Nov. 1992 24 p
(NASA-TM-104566-Vol-4; NAS 1.15:104566-Vol-4; Rept-93B00016) Avail: CASI HC A03/MF A01

The Sea-viewing Wide Field-of-View Sensor (SeaWiFS) instrument will sample at approximately a 1-km resolution at nadir, which will be broadcast for reception by realtime ground stations. However, the global data set will be comprised of coarser, 4-km data, which will be recorded and broadcast to the SeaWiFS Project for processing. Several algorithms for degrading the 1-km data to 4-km data are examined using imagery from the Coastal Zone Color Scanner (CZCS) in an effort to determine which algorithm would be best preserve the statistical characteristics of the derived products generated from the 1-km data. Of the algorithms tested, subsampling based on a fixed pixel within a 4x4 pixel array is judged to yield the most consistent results when compared to the 1-km data products. Author

51 LIFE SCIENCES (GENERAL)

N93-31161# International Centre for Theoretical Physics, Trieste (Italy).
SPONTANEOUS REGULATING MECHANISMS THAT MAY HAVE LED TO THE ORIGIN OF LIFE
J. ChelaFlores Jul. 1992 13 p

(DE93-603677; IC-92/170) Avail: CASI HC A03/MF A01 (US Sales Only)

According to Salam condensation may be relevant in biochemistry as a factor contributing to the homochirality of amino acids. An attempt was made to show that DNA packaging may be modeled, by interpreting chromatin as a form of soft matter, in which a phase transition has induced chromatin into a condensed mode. In the context of the origin of life, it is shown the relevance of simultaneous discussion of DNA packaging, transcription, and DNA replication. Beyond a certain critical length of the protogenome (RNA), physical properties of inert condensed matter may have given rise to a spontaneous regulating mechanism of certain significance for the evolution of life on Earth. DOE

N93-32035 Catholic Univ. of America, Washington, DC. Vitreous State Lab.

MECHANISMS OF MICROWAVE INDUCED DAMAGE IN BIOLOGIC MATERIALS Final Report, 22 Sep. 1986 - 21 Sep. 1992

T. A. Litovitz 1 Oct. 1992 92 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract DAMD17-86-C-6260)

(AD-A264415) Avail: CASI HC A05

Concerns over the possibility that exposure to electromagnetic fields can have adverse health consequences has prompted research into the mechanism of interaction between electromagnetic fields and living cells. A six-year study at the Catholic University of America has included experimental and theoretical studies that attempt the following: (1) to firmly establish whether or not there are, in fact, any athermal effects on living cells that can be attributed to exposure to electromagnetic fields; (2) to determine and explain the dose-response relationship between bioeffects and EM field parameters; and (3) to discover how biologic cells can detect very weak ambient fields which are much smaller than intrinsic EM noise fields always present. In this work we report that significant contributions have been made to each of the three areas described above. DTIC

N93-32354*# Sverdrup Technology, Inc., Huntsville, AL.

MICROBIOLOGICAL TEST RESULTS OF THE ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEMS VAPORS COMPRESSION DISTILLATION SUBSYSTEM RECYCLE TANK COMPONENTS FOLLOWING VARIOUS PRETREATMENT PROTOCOLS

Tim Huff Jul. 1993 9 p

(Contract NAS8-37814)

(NASA-CR-192570; NAS 1.26:192570) Avail: CASI HC A02/MF A01

Microbiological samples were collected from the recycle tank of the vapor compression distillation (VCD) subsystem of the water recovery test at NASA MSFC following a 68-day run. The recycle tank collects rejected urine brine that was pretreated with a commercially available oxidant (Oxone) and sulfuric acid and pumps it back to the processing component of the VCD. Samples collected included a water sample and two swab samples, one from the particulate filter surface and a second from material floating on the surface of the water. No bacteria were recovered from the water sample. Both swab samples contained a spore-forming bacterium, Bacillus insolitus. A filamentous fungus was isolated from the floating material. Approximately 1 month after the pretreatment chemicals were changed to sodium hypochlorite and sulfuric acid, a swab of the particulate filter was again analyzed for microbial content. One fungus was isolated, and spore-forming bacteria were observed. These results indicate the inability of these pretreatments to inhibit surface attachment. The implications of the presence of these organisms are discussed. Author (revised)

N93-32365*# Sverdrup Technology, Inc., Huntsville, AL.

OPTIMIZATION OF 15 PARAMETERS INFLUENCING THE LONG-TERM SURVIVAL OF BACTERIA IN AQUATIC SYSTEMS

D. C. Obenhuber Jul. 1993 21 p

(Contract NAS8-37814)

(NASA-CR-192571; NAS 1.26:192571) Avail: CASI HC A03/MF A01

NASA is presently engaged in the design and development of a water reclamation system for the future space station. A major concern in processing water is the control of microbial contamination. As a means of developing an optimal microbial control strategy, studies were undertaken to determine the type and amount of contamination which could be expected in these systems under a variety of changing environmental conditions. A laboratory-based Taguchi optimization experiment was conducted to determine the ideal settings for 15 parameters which influence the survival of six bacterial species in aquatic systems. The experiment demonstrated that the bacterial survival period could be decreased significantly by optimizing environmental conditions. Author

N93-32423# National Defence Research Establishment, Umea (Sweden). NBC Defence Dept.

MICRO-ORGANISMS, CYTOTOXINS AND RADIOACTIVE PREPARATION: RISKS AT RESCUE OPERATIONS IN HOSPITAL ENVIRONMENT [MIKROORGANISMER, CYTOSTATIKA, RADIOAKTIVA PREPARAT: RISKER VID RAEDDNINGSINSATS I SJUKHUSMILJOE]

Indra Svensson Aug. 1992 32 p In SWEDISH

(FOA-A-40065-4.5; ETN-93-94028) Avail: CASI HC A03/MF A01; National Defence Research Establishment, S-901 82 Umea, Sweden, HC

The development of society leads to an increased handling of microorganisms, cytotoxins, and radiological preparations in pharmacies, hospital institutions, and in certain factories. The question of whether these organisms/subjects imply special risks for the staff of the rescue board when working in these types of premises is addressed. ESA

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

N93-31061# Texas A&M Univ., College Station. Dept. of Biology.

MELATONIN, THE PINEAL GLAND, AND CIRCADIAN RHYTHMS Annual Report, 1 Mar. 1992 - 30 Apr. 1993

Vincent M. Cassone 30 Apr. 1992 22 p

(Grant AF-AFOSR-0244-90)

(AD-A264099; AFOSR-93-0306TR) Avail: CASI HC A03/MF A01

Amniote circadian organization derives from the interaction circadian oscillator and photoreceptors located in the hypothalamic suprachiasmatic nuclei (SCN), the pineal gland, and the eyes. In mammals, circadian organization is dominated by the SCN which serve as 'master pacemakers' in the control of a wide array of behavioral and physiological rhythms including locomotion, sleep/wake, thermoregulation, cardiovascular function, and many endocrine processes. Among the rhythms under SCN control in mammals is the circadian synthesis and secretion of the pineal hormone melatonin which relies on a multi-synaptic pathway via the sympathetic nervous system to maintain and entrain rhythmicity in this hormone. Several studies have indicated that pineal melatonin feeds back on SCN rhythmicity to modulate circadian patterns of activity and other processes. However, the nature and system-level significance of this feed-back is unknown. Recently published work indicates that while pinealectomy does not affect rat circadian rhythms in LD or DD, wheel-running activity rhythms are severely disrupted in LL. These data suggest that either pineal feedback regulates the light sensitivity of the SCN and/or it affects coupling among circadian oscillators within the SCN or between the SCN and its output. Research in our laboratory is currently addressing each of these hypotheses. DTIC

N93-31094# Texas Univ. Health Science Center, San Antonio.

INVESTIGATION OF LASER-INDUCED RETINAL DAMAGE Annual Report, 1 Apr. 1992 - 31 Mar. 1993

Randolph D. Glickman and Kwok-Wai Lam 20 Apr. 1993 11 p

(Grant AF-AFOSR-0208-91)

(AD-A264096; UTHSCSA-OPH-93-01; AFOSR-93-0304TR) Avail: CASI HC A03/MF A01

Laser-induced damage in ocular tissue was studied with biochemical measures designed to characterize cellular damage mechanisms. Photochemical damage was identified by evidence of oxidative reactions resulting from photosensitizers and free radicals activated by the light exposure. Melanin, in the retinal pigment epithelial (RPE) cells, formed a free radical during illumination that rapidly oxidized ascorbic acid (AA). This specific reaction may safely direct excess photons into a chain of coupled redox reactions. RPE cells have a high capacity for utilizing AA; the cells have different transporters for AA and its oxidized form, dehydro-L-ascorbic acid (DHA), and are able to reduce DHA to AA. The kinetics of these transporters were measured in these studies. Light-activated melanin was also shown to react with linoleic acid, a model lipid. Thus, in the absence

of sufficient AA, the melanin radical may initiate lipid peroxidation, a known concomitant of photochemical damage. Development of assays indicative of thermal damage was also started. Initial results suggested that extracellular potassium ion concentration increased following laser-induced thermal stress in RPE cells. This change was hypothesized to result from damage to sodium-potassium ionic pumps in the cell's plasma membrane. DTIC

N93-31138# EXOS, Inc., Burlington, MA.
PREVENTION OF CUMULATIVE TRAUMA DISORDERS
W. G. Richardson and B. A. Marcus Nov. 1992 98 p
(Grant NIOSH-R43-OH02097)
(PB93-188332) Avail: CASI HC A05/MF A02

The use of the GripMaster (GM) to measure the forces involved in hand functions performed on the job was investigated. The GM was designed to measure flexion/extension and radial/ulnar deviation of the wrist plus up to five finger and hand forces. In laboratory experiments the GM's force measurements were compared to a hand dynamometer and electromyograph measurement techniques; measurements of static wrist postures with the GM were compared to video analysis techniques. Force sensor reliability was tested. The GM was field tested at a lock manufacturing facility. While the GM tested in the study demonstrated a high degree of correlation with the more established techniques under certain circumstances, the calibration techniques and the ranges of force and motion measured were shown to be inadequate. The authors conclude that by extending the sensor range, improving the calibration techniques, and making the force sensing technology more robust, the GM can be a valuable tool in assessing and quantifying cumulative trauma disorder risks. NTIS

N93-31140# Centers for Disease Control, Atlanta, GA.
FUNDAMENTAL DIAGNOSTIC HEMATOLOGY: ANEMIA (SECOND EDITION)
B. L. Evatt, W. N. Gibbs (World Health Organization, Geneva, Switzerland.), S. M. Lewis (Hammersmith Hospital, London, England.), and J. R. McArthur (Washington Univ., Seattle.) 1992 147 p See also PB85-123313
(PB93-188662) Avail: CASI HC A07/MF A02

The guiding principle in the book has been to provide a practical approach with maximal use of simple tests for diagnosing anemia. For this reason the usefulness of blood film morphology has been emphasized. Indeed, in many cases, measurement of hemoglobin and examination of a blood film can (with some training) provide all the information necessary for identifying the prevalent kinds of anemia of public health importance in an area. Bone marrow examination has been included because it can be done relatively easily by a physician, and can provide information about the iron status as well as morphological data needed for diagnosis. Detailed discussion of the physiology and biochemistry of the red cell is beyond the scope of the book. However, brief comments are included because an understanding of normal red cell physiology is helpful for correlating the morphological changes of the red cells and results of other basic tests with the causes of anemia. NTIS

N93-31158# Centers for Disease Control, Atlanta, GA.
FUNDAMENTAL DIAGNOSTIC HEMATOLOGY: THE BLEEDING AND CLOTTING DISORDERS (SECOND EDITION)
B. L. Evatt, W. N. Gibbs (World Health Organization, Geneva, Switzerland.), S. M. Lewis (Hammersmith Hospital, London, England.), and J. R. McArthur (Washington Univ., Seattle.) 1992 122 p
(PB93-188670) Avail: CASI HC A06/MF A02

The first edition of the manual was published in 1985. In preparing the second edition, the rapid expansion of the field of hemostasis and the attendant advances in knowledge of the pathophysiology of bleeding and thrombosis has been taken into account. New and updated methods have been included where necessary, while retaining the essential requirement that the manual be designed for use in intermediate laboratories whose facilities are restricted to basic tests. The manual is also intended to help both laboratory staff and physicians deal with patients with bleeding and thrombotic disorders. Sections dealing with diagnosis and management of thromboembolic disease have been included and the title has been changed to reflect this. The importance of quality assurance to ensure reliable results has been emphasized. The chapter on this topic has been extensively revised, and procedures are described for internal quality control. These procedures are easily practiced in any laboratory. Increased awareness of the danger of blood-borne infectious diseases and other hazards has led to the inclusion of a chapter on laboratory safety. NTIS

N93-31225# Australian Inst. of Nuclear Science and Engineering, Lucas Heights.
THE THIRTEENTH AINSE RADIATION BIOLOGY CONFERENCE: CONFERENCE HANDBOOK
1991 74 p Presented at the AINSE Rediation Biology Conference, Lucas Heights, Australia, 2-4 Oct. 1991
(DE93-609131; INIS-mf-13374; CONF-9110426) Avail: CASI HC A04/MF A01 (US Sales Only)

The 13th Australian Institute of Nuclear Science and Engineering (AINSE) Radiation Biology conference was held 2-4 Oct. 1991. The forty one papers presented at this conference covered the areas of radiation induced lesions, apoptosis, genetics and radiobiological consequences of low level radiation exposure, clinical applications of radiation, mammalian cells radiosensitivity, and radiation-activated proteins. DOE

N93-31917# Army Research Inst. of Environmental Medicine, Natick, MA.
AN ANNOTATED BIBLIOGRAPHY OF RESEARCH INVOLVING WOMEN, CONDUCTED AT THE US ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE Final Report
James A. Vogel and Anita K. Gauger 1993 65 p
(AD-A265497) Avail: CASI HC A04/MF A01

Recently, considerable attention has been given to the lack of biomedical research on women's health problems. Within the military services, this concern for lack of research with women or lack of inclusion of women subjects in research has been extended to most areas of human performance investigation. As women move into an increasing number of military occupations, it is apparent most military research on health and performance has been conducted on male research volunteers. The many anthropometric, body compositional, physiological, and endocrinological differences between genders make it obvious that much of the male research data can not be readily extrapolated to females. Although this issue has only recently received broad attention, the U.S. Army Research Institute of Environmental Medicine (USARIEM) has already executed many studies which either addresses women-related issues or include women in the study population. This report is a bibliography of these studies, complete with abstracts, intended to serve as a convenient resource for women-related health and performance research information. It is anticipated that these references will prompt additional biomedical research related to women in the military. DTIC

N93-31924* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 377)
Jul. 1993 82 p
(NASA-SP-7011(377); NAS 1.21:7011(377)) Avail: CASI HC A05

This bibliography lists 223 reports, articles, and other documents recently introduced into the NASA Scientific and Technical Information System. Subject coverage includes: aerospace medicine and physiology, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance. Author (revised)

N93-31981# North Carolina Univ., Chapel Hill. Div. of Otolaryngology.
AUDITORY SPECTRO-TEMPORAL PATTERN ANALYSIS Final Report, 1 Dec. 1989 - 31 Dec. 1992
Joseph W. Hall 15 Mar. 1993 11 p
(Grant AF-AFOSR-0106-90)
(AD-A264691; AFOSR-93-0252TR) Avail: CASI HC A03/MF A01

The long-term aim of this project was a better understanding of auditory processes which use across-frequency or across-ear temporal envelope and modulation difference cues to aid performance. Areas of investigation included comodulation masking release (CMR), the masking-level difference (MLD), temporal resolution, and the processing of amplitude and frequency modulation. The goals of the proposed experiments were to (1) examine the possible relation between CMR and auditory phenomena related to auditory grouping, or auditory scene analysis; (2) examine how CMR and MLD effects combine, and to examine the possible relation between CMR

and the MLD for narrowband noise maskers; (3) to determine the extent to which across-frequency correlation of temporal envelopes may influence gap detection for wideband stimuli; (4) determine whether masking release can be derived from cues based upon across frequency coherence of frequency modulation; (5) examine a modulation masking phenomenon related to frequency modulation. The tasks involved signal detection in masking noise, temporal gap detection, and the detection of frequency modulation. DTIC

N93-32015# Pittsburgh Univ., PA. Dept. of Psychiatry.
ORGANIZATION OF THE HUMAN CIRCADIAN SYSTEM Final Report, 1 Feb. 1991 - 31 Jan. 1993
Robert Y. Moore 31 Jan. 1993 10 p
(Grant AF-AFOSR-0175-91)
(AD-A264675; AFOSR-93-0336TR) Avail: CASI HC A02/MF A01

In brains obtained from late gestation fetuses (33-36 weeks), newborns, and young individuals to approximately age 50, the SCN is virtually always identifiable as a discrete nucleus with clear boundaries. From age 50-90, it is sometimes evident and sometimes not evident in the material. We have completed analysis of 22 hypothalami prepared for immunocytochemistry, including quantitative analysis. Sections are routinely stained for VIP, VP, NPY, and NT. This analysis has revealed several interesting aspects of the human SCN. First, in contrast to what is found in Nissl material, the SCN is always evident as a distinct nucleus in immunocytochemical material. Second, it appears as the first component of the hypothalamus to be found in a rostrocaudal set of coronal sections. Third, the human SCN is characterized by four separate populations of neurons that have different peptide content. These neuronal populations have a different distribution in the nucleus. In contrast to all other mammals, the human SCN contains a population of NPY + neurons that overlaps the VIP + group but extends dorsally beyond it in the center on the SCN. Among the NPY + neurons are scattered coarse fibers and varicosities and a fairly dense plexus of very fine fibers and small varicosities. These are very similar in morphology to GHT projections in other mammals, particularly the cat, and monkey. DTIC

N93-32018# Dalhousie Univ., Halifax (Nova Scotia). Dept. of Psychology.
NEUROPHYSIOLOGICAL ANALYSIS OF CIRCADIAN RHYTHM ENTRAINMENT Final Report, 1 Jan. 1990 - 31 Dec. 1992
Benjamin Rusak 30 Mar. 1993 15 p
(Grant AF-AFOSR-0104-90)
(AD-A264681; AFOSR-93-0335TR) Avail: CASI HC A03/MF A01

We review recent studies in our laboratory which have investigated the neural mechanisms underlying photic entrainment of the mammalian circadian system. The results from studies of extracellular single-unit recordings and of photic induction of Fos-like immunoreactivity (-lir) indicate that excitatory amino acid (EAA) transmission, and particularly, activation of the NMDA receptor subtype, is important for conveying photic information to suprachiasmatic nucleus (SCN) cells. We have also found that a sub-region of the SCN still shows Fos-lir after blockade of EAA receptors, and we have evidence suggesting that these cells are innervated by a distinct subdivision of the retinal projection to the SCN. In addition, we have found that photic responses of cells in the intergeniculate leaflet (which projects to the SCN) and of SCN cells are modulated by serotonin via a receptor that resembles the 5HT1A subtype. DTIC

N93-32237 Institute of Sound and Vibration Research, Southampton (England). Audiology and Human Effects Group.
TRANSMISSION OF VIBRATION THROUGH THE HUMAN BODY TO THE HEAD: A SUMMARY OF EXPERIMENTAL DATA
Gurmail S. Paddan and Michael J. Griffin May 1993 163 p Sponsored by the UK Ministry of Defence
(ISVR-TR-218) Copyright Avail: Issuing Activity (Institute of Sound and Vibration Research, University of Southampton, Southampton SO9 5NH, England)

The transmission of vibration through the human body to the heads of seated and standing persons is presented. For seated subjects, the transmission of vibration to the head is documented for each of the six orthogonal axes of seat motion (fore-and-aft, lateral, vertical, roll, pitch, and yaw). For standing subjects, the transmission of vibration to the head is documented for three translational axes of floor vibration. In all cases, the head motion was measured in all six axes. Twelve adult male subjects took part in these experiments. The effects of sitting posture and standing posture on transmissibility were determined. The postures for the sitting condition were 'back-on' (leaning slightly against the seat backrest). Different postures were used for each axis of floor vibration with the standing subjects: holding a handrail with two different grips during exposure to fore-and-aft vibration; standing with three different foot separations during exposure to lateral vibration; standing with three different postures of the legs during exposure to vertical vibration. Median transmissibilities and the inter-quartile ranges of transmissibilities were calculated between the input motion (seat or floor acceleration) and head motion. These data are presented in graphical and tabular form. Author

N93-32364*# Good Samaritan Hospital and Medical Center, Portland, OR.
TORSIONAL VESTIBULO-OCULAR REFLEX MEASUREMENTS FOR IDENTIFYING OTOLITH ASYMMETRIES POSSIBLY RELATED TO SPACE MOTION SICKNESS SUSCEPTIBILITY
Robert J. Peterka 23 Jul. 1993 8 p Presented at the 10th IAA Man in Space Symposium, Tokyo, Japan, Apr. 1993
(Grant NAG9-117)
(NASA-CR-193304; NAS 1.26:193304) Avail: CASI HC A02/MF A01

Recent studies have identified significant correlations between space motion sickness susceptibility and measures of disconjugate torsional eye movements recorded during parabolic flights. These results support an earlier proposal which hypothesized that an asymmetry of otolith function between the two ears is the cause of space motion sickness. It may be possible to devise experiments that can be performed in the 1 g environment on earth that could identify and quantify the presence of asymmetric otolith function. This paper summarizes the known physiological and anatomical properties of the otolith organs and the properties of the torsional vestibulo-ocular reflex which are relevant to the design of a stimulus to identify otolith asymmetries. A specific stimulus which takes advantage of these properties is proposed. Author (revised)

N93-31454*# McDonnell-Douglas Space Systems Co., Houston, TX.
HYPERBARIC TREATMENT
Michael T. Amoroso *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 391-411 (For primary document see N93-31439 12-18)
Avail: CASI HC A03/MF A04

N93-31455*# McDonnell-Douglas Space Systems Co., Houston, TX.
DAILY EXERCISE ROUTINES
Patrick L. Anderson and Michael T. Amoroso *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 413-418 (For primary document see N93-31439 12-18)
Avail: CASI HC A02/MF A04

N93-32249# Service de Medecine Aeronautique, Versailles (France).
LIPODYSTROPHIES IN THE FRENCH MILITARY FLIGHT CREW [LES DYSLIPIDEMIES DANS LE PERSONNEL NAVIGANT MILITAIRE FRANCAIS]
A. Seigneuric, J. P. Burlaton, J. Deroche, R. Richard, and A. Boussif *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 5 p In FRENCH (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A01/MF A03

N93-32250# Hellenic Air Force Aeromedical Center, Athens (Greece).
LIPIDEMIC PROFILE OF HELLENIC AIRFORCE OFFICERS
J. Palermos, A. Kitsou, S. Michalopoulou, and K. Kyriakos *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 4 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A01/MF A03

N93-32251# Royal Air Force Central Medical Establishment, London (England).
BLOOD LIPIDS IN AIRCREW RECRUITS AND IN RAF AVIATORS
D. H. Hull *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 8 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A02/MF A03

N93-32252# Italian Air Force Pratica di Mare, Rome.
CARDIOVASCULAR RISK FACTORS IN AN ITALIAN AIR FORCE POPULATION: PRELIMINARY REPORT
S. Farrace, L. Sakara, L. Urbani, and C. DeAngelis *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 4 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A01/MF A03

N93-32253# Centro de Instruccion de Medicina Aeroespatial, Madrid (Spain).
CARDIOVASCULAR RISK FACTORS (CVRF) IN SPANISH PILOTS WITH CORONARY ARTERY DISEASE DEMONSTRATED BY ANGIOGRAPHIC STUDIES
M. A. Gomez-Marino, C. Alonso, and F. Rios *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 10 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A02/MF A03

N93-32254# German Air Force, Fuerstenfeldbruk (Germany). Aviation Medicine Div.
RESULTS AND MANAGEMENT OF PATHOLOGICAL LIPOPROTEIN CONCENTRATIONS AND OTHER CARDIOVASCULAR RISK FACTORS IN MILITARY PILOTS OF THE GERMAN FEDERAL ARMED FORCES
Erich Roedig *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 8 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A02/MF A03

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N93-31229# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany). Abt. Luft- und Raumfahrtspsychologie.
COMPUTER-GENERATED PARALLEL TESTS FOR APTITUDE MEASUREMENT IN THE SELECTION OF AVIATION OPERATORS [COMPUTER-GENERIERTE PARALLEL-TESTS FUER DIE FAEHIGKEITSMESSUNG IN DER EIGNUNGSAUSWAHL VON OPERATIONELLEM LUFTFAHRTPERSONAL]
Klaus-Martin Goeters and Hermann Rathje Sep. 1992 113 p In GERMAN
(DLR-FB-92-29; ETN-93-93960) Avail: CASI HC A06/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

Psychological aptitude tests for pilot selection are developed in order to avoid external coaching and test repetition and to enable standardized performance testing. Objectives and development methodologies of the test program are presented. The following tests are described: position test for acquisition of inductive thinking, memorization of symbols and numbers, clearance test for acquisition of auditive sensitibility, concentration tests for attentiveness control, aircraft position tests for acquisition of spatial orientation, and cube rotation test for mental spatial manipulation ability evaluation. Psychometric qualities are discussed for each test. For individual titles, see N93-31230 through N93-31238.

N93-31230# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
BACKGROUND AND OBJECTIVES OF THE PARAT PROGRAM [HINTERGRUENDE UND ZIELSETZUNGEN DES PARAT-PROGRAMMS]
Klaus-Martin Goeters *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators Sep. 1992 p 9-14 In GERMAN (For primary document see N93-31229 12-53)
Avail: CASI HC A02/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

The PARAT 2000 program, which is part of selection programs of huge aviation organizations and is designed for psychological aptitude measurement validation in order to avoid external coaching and test repetition and to enable a standardized pilot performance testing, is described. The role of test repeatability, time delay between two tests, and previous study of test questions on the response quality is investigated. Parallel test versions were created and implemented with frequent renewal to reduce memory influence on test results. Processes were developed to allow psychological aptitude tests to be computer generated for selection of aircraft and space pilots. The first development phase was focused on logical thinking, short term and associative memory perception and attentiveness, spatial orientation, and visualization. ESA

N93-31231# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
PHASES OF THE PROJECT DEVELOPMENT AND EXAMINATION METHODOLOGIES [PHASEN DER PROJEKTABWICKLUNG UND UNTERSUCHUNGSMETHODIK]
Hermann Rathje *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators Sep. 1992 p 15-25 In GERMAN (For primary document see N93-31229 12-53)
Avail: CASI HC A03/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

Steps of test program development and proving and the methodological aspects of examination, such as population sampling and statistical processes, are described. The reference tests which are used for estimation of characteristics validity of new tests are presented. Test item construction and array to parallel forms were carried out by implementation of computer programmed algorithms and test layouts were adapted to DLR standards. Test preforms were examined under time controlled conditions with first pilot groups in the framework of aptitude studies for identifying test comprehensibility and representation time problems and estimating test reliability, after division of the test into two parallel equal parts. Test values were represented by an approximated normal distribution to establish that a satisfying and reliable differentiation of tested persons can be made. The Fisher reliability model was used for investigating test parallelism. ESA

N93-31232# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
THE POSITION TEST: A COMPUTER GENERATED PROCESS FOR ACQUISITION OF INDUCTIVE LOGIC THINKING [DER POSITIONS-TEST (POS): EIN COMPUTERGENERIERTES VERFAHREN ZUR ERFASSUNG DES INDUKTIV LOGISCHEN DENKENS]
Manfred Barbarino *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators Sep. 1992 p 27-34 In GERMAN (For primary document see N93-31229 12-53)
Avail: CASI HC A02/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

A test process for acquisition of inductive logic thinking is developed. The item material is made of free language signs and symbols and can be implemented without language limitation. Parallel version generation is possible through computer supported processes. Several verified test versions showed good adaptation to normal distribution by testing psychometric properties. Regular distributions of item difficulties, selectivity, and item intercorrelations were obtained after test revision. It is established, that knowledge of different item rules is conditioned by logical thinking processes and moderated by other cognitive mechanisms such as cognitive flexibility and learning ability. Validity of position test is demonstrated by comparing a mathematical logic test process with position test. ESA

N93-31233# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
THE TEST MEMORIZATION OF SYMBOLS AND NUMBERS: A COMPUTER GENERATED TEST FOR VISUAL SENSITIVITY [DER TEST MEMORIZATION OF SYMBOLS AND NUMBERS(MSN): EIN COMPUTERGENERIERTER TEST DER VISUELLEN MERKFAEHIGKEIT]
Hermann Rathje *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators Sep. 1992 p 35-45 In GERMAN (For primary document see N93-31229 12-53)
Avail: CASI HC A03/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

A test of memorization is developed independently on language. Parallel version generation is possible through computer supported processes. Psychometric properties and parallel test reliability are satisfying. Factor analysis examinations show test validity as visual sensitivity test. The test is designed to examine pilot capabilities for cockpit information flow acquisition and processing and is based on short term and associative

memory exercises: symbols are presented to the pilot with a related number; the pilot must find the number when the symbol occurs. ESA

N93-31234# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
THE CLEARANCE TEST: A COMPUTER GENERATED PROCESS FOR ACQUISITION OF AUDITIVE SHORT TERM SENSITIVITY [DER CLEARANCE-TEST (CLE): EIN COMPUTERGENERIERTES VERFAHREN ZUR ERFASSUNG DER AUDITIVEN KURZZEITMERKFAEHIGKEIT]
Hermann Rathje *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators Sep. 1992 p 47-59 In GERMAN (For primary document see N93-31229 12-53)
Avail: CASI HC A03/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

A test for auditive capacity detection is improved with consideration of objectivity and reliability. Item models are developed under strongly controlled conditions such as sound level, diction velocity, and conservation duration and delay. A good knowledge of the English language is needed to answer the questions, which are made of a short, acoustically presented combination of letters and numericals, without signification, followed by three identical or nearly similar combinations. Identical parts of announcements must be identified. Some combinations are superposed with a white noise to estimate pilot sensitivity to perturbations. Value distribution was proved by means of the Kolmogoroff-Smirnoff test. Difficulty, selectivity, and reliability estimations were achieved. ESA

N93-31235# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
THE CONCENTRATION LOADING TEST SYSTEM: A COMPUTER GENERATED PROCESS FOR ACQUISITION OF ATTENTIVENESS CONTROL [DAS KONZENTRATIONS-BELASTUNGS-PRUEFSYSTEM (KPB): EIN COMPUTERGENERIERTES VERFAHREN ZUR ERFASSUNG DER AUFMERKSAMKEITSSTEUERUNG]
Klaus-Martin Goeters *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators Sep. 1992 p 61-69 In GERMAN (For primary document see N93-31229 12-53)
Avail: CASI HC A02/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

A test for attentiveness and concentration abilities evaluation is presented. The test demands aptitudes in perception, recognition and calculation. Numerous parallel tests can be simultaneously performed and an economic automatic evaluation can be realized by means of reacting displays. The test is based on visual searching and processing of combinations of numerals and symbols which can be generated by a computer program. Test values were proved with the Kolmogoroff-Smirnoff test and were described by a normal distribution. Statistical correlations were achieved to ascertain test reliability. ESA

N93-31236# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
THE AIRCRAFT POSITION TESTS: A COMPUTER GENERATED PROCESS FOR ACQUISITION OF SPATIAL ORIENTATION CAPABILITY [DER FLUGZEUG-POSITIONS-TEST (FPT): EIN COMPUTER GENERIERTES VERFAHREN ZUR ERFASSUNG DES RAEUMLICHEN ORIENTIERUNGSVERMOEGENS]
Irene Sus *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators Sep. 1992 p 71-80 In GERMAN (For primary document see N93-31229 12-53)
Avail: CASI HC A02/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

A test for spatial orientation ability evaluation is presented. The test consists of rapidly choosing direction variations with an aircraft from an estimated leaving position. A Turbo PASCAL computer program allows numerous items to be produced and parallel test versions to be obtained. Aircraft position test is shown to be a very economic and objective test process. Test values were proved with the Kolmogoroff-Smirnoff test and are shown to be correctly described by a normal distribution. Parallel test correlations were achieved for reliability estimations. Validity examinations were carried out by introducing the Pearson correlation coefficient and revealed the pilot concentration influence on results. ESA

N93-31237# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
THE CUBE ROTATION TEST: A COMPUTER GENERATED PROCESS FOR ACQUISITION OF MENTAL SPATIAL MANIPULATOR CAPABILITY [DER WUERFEL-ROTATIONS-TEST (ROT): EIN COMPUTERGENERIERTES VERFAHREN ZUR ERFASSUNG DER FAEHIGKEIT ZUR MENTALEN RAEUMLICHEN MANIPULATION]
Gabriele Stahlberg *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators Sep. 1992 p 81-92 In GERMAN (For primary document see N93-31229 12-53)
Avail: CASI HC A03/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

A test for detection of pilot abilities for representation of spatial occurrences and for recognition of spatial relations between objects is presented. Particular attention is given to capabilities of mentally rotating, distorting, and splitting up a two or three dimensional object. The pilot must develop a mental image of a body after acoustic information and generate toppling and rotation motions to put a cube in a given position. An algorithm was written in the Turbo PASCAL language for producing numerous motion configurations. Test reliability was estimated with Cronbach alpha coefficient. Test selectivity, difficulty, and internal consistence were examined with satisfying results. ESA

N93-31238# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
THE PARAT TESTS AS EXAMINATION SYSTEM [DIE PARAT-TESTS ALS UNTERSUCHUNGSSYSTEM]
Hermann Rathje *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators Sep. 1992 p 93-107 In GERMAN (For primary document see N93-31229 12-53)
Avail: CASI HC A03/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

The set of new pilot aptitude tests is reviewed. An examination of how the applicants have used and considered the information brochure they received before the tests was made to determine brochure utility and the role of coaching on applicant results. Statistical correlations show that applicants who consider the brochure as useful had good test results. A correlation matrix was calculated, based on factor analysis, in order to ascertain test system integrability. Error value structure was studied by means of statistical analysis. ESA

N93-31729 Civil Aviation Authority, London (England).
MANDATORY MULTI-ENGINED TRAINING SYLLABUS
Jun. 1992 32 p
(CAP-601; ISBN-0-86-039518-9; ETN-93-93931) Copyright Avail: Issuing Activity (Civil Aviation Authority, Greville House, 37 Gratton Road, Cheltenham, England, HC)

A training syllabus produced by the United Kingdom Civil Aviation Authority for use by all flying training organizations wishing to conduct the mandatory course for multiengined flying training is presented. The flight and ground training are detailed. The course aims to give a sound theoretical knowledge of multiengined aircraft operation and to teach the skills necessary for the safe and competent operation of such aircraft. An abridged turbojet course is also described. ESA

N93-32011# Battelle Columbus Labs., Research Triangle Park, NC.
SELECTION OF PERSONNEL FOR STRESSFUL OCCUPATIONS: THE POTENTIAL UTILITY OF PSYCHOPHYSIOLOGICAL MEASURES AS SELECTION TOOLS Final Report, Aug. 1991 - Nov. 1992
Ronald J. Heslegrave and Caran Colvin Mar. 1993 70 p
(Contract DAAL03-86-D-0001; DA Proj. 2Q2-63007-A-792)
(AD-A264571; ARI-TR-975) Avail: CASI HC A04/MF A01

The Manpower and Personnel Research Division identified a requirement to assess whether selection and classification for stressful occupations could be improved. An interdisciplinary review, evaluation, and synthesis was carried out to assess the feasibility of using psychophysiological measures to select individuals resistant to stress to improve selection and classification methods for stressful occupations. To integrate this literature, a new psychophysiological model was developed in the context of current industrial/organizational practice. Researchers concluded that psychophysiological measures do have the potential to improve the selection/classification standards for stressful occupations. Three

recommendations were made for future research. First, experimentation should begin to assess the validity of the proposed psychophysiological measures to predict successful performance under stress. Second, since people who cope successfully appear to share some personality traits, research should be conducted into the personality correlates of successful task performance under stress. Third, occupations should be analyzed in terms of stress dimensions to provide a rationale for the identification of valid predictors and criteria of successful performance in stressful jobs. A demonstration study was outlined. DTIC

N93-32064# Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Computer Science.
CONNECTIONIST MODELS AND LINGUISTIC THEORY: INVESTIGATIONS OF STRESS SYSTEMS IN LANGUAGE
Prahlad Gupta and David S. Touretzky Apr. 1993 34 p
(Contract N00014-86-K-0678)
(AD-A265450; CMU-CS-93-146) Avail: CASI HC A03/MF A01

We question the widespread assumption that linguistic theory should guide the formulation of mechanistic accounts of human language processing. We develop a pseudo-linguistic theory for the domain of linguistic stress, based on observation of the learning behavior of a perceptron exposed to a variety of stress patterns. There are significant similarities between our analysis of perceptron stress learning and metrical phonology, the linguistic theory of human stress. Both approaches attempt to identify salient characteristics of the stress systems under examination without reference to the workings of the underlying processor. Our theory and computer simulations exhibit some strikingly suggestive correspondences with metrical theory. We show, however, that our high-level pseudo-linguistic account bears no causal relation to processing in the perceptron, and provides little insight into the nature of this processing. Because of the persuasive similarities between the nature of our theory and linguistic theorizing, we suggest that linguistic theory may be in much the same position. DTIC

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

For related information see also *16 Space Transportation.*

N93-31844*# Wyoming Univ., Laramie. Dept. of Computer Science.
A VISION SYSTEM PLANNER FOR INCREASING THE AUTONOMY OF THE EXTRAVEHICULAR ACTIVITY HELPER/RETRIEVER
Michael Magee 1 Jun. 1993 54 p
(Grant NAG9-634)
(NASA-CR-193301; NAS 1.26:193301) Avail: CASI HC A04/MF A01

The Extravehicular Activity Retriever (EVAR) is a robotic device currently being developed by the Automation and Robotics Division at the NASA Johnson Space Center to support activities in the neighborhood of the Space Shuttle or Space Station Freedom. As the name implies, the Retriever's primary function will be to provide the capability to retrieve tools and equipment or other objects which have become detached from the spacecraft, but it will also be able to rescue a crew member who may have become inadvertently de-tethered. Later goals will include cooperative operations between a crew member and the Retriever such as fetching a tool that is required for servicing or maintenance operations. This paper documents a preliminary design for a Vision System Planner (VSP) for the EVAR that is capable of achieving visual objectives provided to it by a high level task planner. Typical commands which the task planner might issue to the VSP relate to object recognition, object location determination, and obstacle detection. Upon receiving a command from the task planner, the VSP then plans a sequence of actions to achieve the specified objective using a model-based reasoning approach. This sequence may involve choosing an appropriate sensor, selecting an algorithm to process the data, reorienting the sensor, adjusting the effective resolution of the image using lens zooming capability, and/or requesting the task planner to reposition the EVAR to obtain a different view of the object. An initial version of the Vision System Planner which realizes the above capabilities using simulated images has been implemented and tested. The remaining sections describe the architecture and capabilities of the VSP and its relationship to the high level task planner. In addition, typical plans that are generated to achieve visual goals for various scenarios are discussed. Specific topics to be addressed will include object search strategies, repositioning of the EVAR to improve the quality of information obtained from the sensors, and complementary usage of the sensors and redundant capabilities. Author

N93-32006# Naval Air Warfare Center, Patuxent River, MD. Aircraft Div.
ABRIDGED PROCEDURAL GUIDE TO AIRCREW ANTHROPOMETRIC ACCOMMODATION ASSESSMENT
Scott A. Price 14 Apr. 1993 69 p
(AD-A265220; NAWCADPAX-TM-992-90-SY) Avail: CASI HC A04/MF A01

NAVAIRSYSCOM (AIR-531) tasked us to investigate and develop new procedures for determining the ranges and limitations of anthropometric accommodation in military aircraft. These procedures quantify what types of aircrew, based on their body's morphologies, are able to safely and efficiently operate a particular crewstation in an operational environment. Aircrew Anthropometric Accommodation Assessment provides detailed, repeatable methods for obtaining the accommodation data needed to determine this. Results are plotted to determine the full range of anthropometric values and their relationship to pilot/aircrew 'fit' for a number of important areas. Use of Aircrew Anthropometric Accommodation Assessment enables the establishment of Anthropometric Restriction Codes, reduces the need for fit-checks, guides student naval aviators into appropriate pipelines, determines contractor compliance with design goals, and identifies deficiencies in the crewstation layout of mockups and aircraft undergoing development. DTIC

N93-32012# Analytics, Inc., Willow Grove, PA.
APPLICATION AND VALIDATION OF WORKLOAD ASSESSMENT TECHNIQUES Final Report, Sep. 1986 - Sep. 1992
Richard E. Christ, Susan G. Hill, James C. Byers, Helene M. Lavecchia, and Allen L. Zaklad Mar. 1993 157 p
(Contract MDA903-86-C-0384; DA Proj. 2Q1-62785-A-790)
(AD-A264575; ARI-TR-974) Avail: CASI HC A08/MF A02

A series of eight separate studies was conducted using three different Army systems. These studies applied both empirical methods for evaluating the workload associated with the operation of Army systems and analytical methods for predicting that workload. The empirical methods examined were variants of four operator rating scale techniques. The analytical methods scale techniques and a task analysis and simulation technique. The three systems studied included a mobile air defense missile system, a remotely piloted air vehicle system, and a helicopter system. DTIC

N93-32240# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Aerospace Medical Panel.
NUTRITION, METABOLIC DISORDERS AND LIFESTYLE OF AIRCREW [LES DESORDRES METABOLIQUES DUS A LA DIETETIQUE ET HYGIENE DE VIE DES EQUIPAGES D'AERONEFS]
Mar. 1993 230 p Symposium held in Oslo, Norway, 19-23 Oct. 1992
(AGARD-CP-533; ISBN-92-835-0703-7) Copyright Avail: CASI HC A11/MF A03

These proceedings include the Technical Evaluation Report and 30 papers of the symposium sponsored by the AGARD Aerospace Medical Panel and held in Oslo, Norway from 19-23 Oct. 1992. The theme of the symposium was to review and update the knowledge pertaining to diet and nutrition as it applies to aircrew. The metabolic disorders, including hyperlipidemia and alterations of carbohydrate metabolism, are common problems in aviation medicine that demand specific attention and management by NATO flight surgeons. Hyperlipidemia is a cardiovascular risk factor that by itself or when combined with cigarette smoking and sedentary behavior as well as other risk factors presents a formidable problem for all NATO Air Forces as this directly impacts at pilot performance. Performance may also be affected by inadequate crew rest, environmental extremes and time zone shifts, all of which were illustrated in the Persian Gulf Conflict. For individual titles, see N93-32241 through N93-32269.

N93-32241# Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Delft (Netherlands). Dept. of Human Nutrition.
AN AUTOMATED PROCESSING SYSTEM FOR FOOD FREQUENCY AND NUTRITION KNOWLEDGE QUESTIONNAIRE
A VanErp-Baart, M. J., I. C. Kistemaker, and M. R. H. Loewik *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 3 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A01/MF A03

In surveys and intervention studies, food frequency questionnaires are often used to assess habitual dietary intake. Although this is a relatively quick and simple method, the number of subjects to be examined can still be enormous. So, without a good system, the time needed for the processing of the amount of data may be prohibitive for starting such a project. To structure and speed up this work, FOFRIPS, a food frequency interactive processing system was developed. The starting point was that not each developed specific questionnaire should be automated, but instead only the general procedures of the data processing. Author (revised)

N93-32242# University of South Florida, Tampa. Coll. of Public Health.
NUTRITIONAL ASSESSMENT OF UNITED STATES TACTICAL AIR COMMAND PILOTS
S. D. Hart Yevich, S. J. Yevich, and C. Morrison *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 5 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A01/MF A03

The nutritional status of 184 TAC fighter pilots was analyzed for caloric intake, macronutrient composition, alcohol intake, and meal frequency. The dietary habits of fighter pilots relative to their age, family configuration, and level of exercise were also examined. The diets of a sub-group of 43 F-16 student fighter pilots were correlated with the subjective graded performance of a Basic Fighter Maneuver. Pilots energy consumption of 2800 kcal fell within the suggested range for the average U.S. male. The macronutrient composition of their diets was better than that of the mean U.S. male, comprising an average of 46% carbohydrates, 34% fats, 15% protein, and 5% alcohol. Missed meals on the day of flying were a frequent occurrence. The older age pilots consumed less fat than their younger counterparts, but their intake of alcohol was greater. Family configuration had no effect on alcohol consumption, caloric intake, or dietary behavior. Pilots who exercised 4 to 7 day a week were heavier than the non-exercisers, and the non-exercisers consumed more alcohol. No statistical difference could be found between total performance scores in the sub-group of F-16 student pilots and any deficiency or excess of specific dietary components or any combinations of these components. Alcohol consumption was shown to be associated with a low G-tolerance score. Author

N93-32243# Oslo Univ. (Norway). Inst. for Nutrition Research.
PORTABLE EQUIPMENT DEVELOPED TO ESTIMATE ENERGY EXPENDITURE BY SIMULTANEOUS RECORDING OF HEART RATE AND BODY POSITION
A. Lovo, B. E. Hustvedt, A. Christophersen, C. C. Christensen (Royal Norwegian Air Force, Oslo.), and H. T. Andersen (Royal Norwegian Air Force, Oslo.) *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 5 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A01/MF A03

The operating principle of Actireg, a new device for registration of changes in human body positions, is described. It is robust and functions well also during prolonged periods of high physical activity, in contrast to accelerometers and other devices used as motion sensors. Preliminary experiments indicate that combined use of heart rate and body position recording for estimation of energy expenditure may be superior to the use of heart rate registrations alone. However, validation experiments with doubly labeled water or a whole body calorimeter are needed in order to reach a firm conclusion on this point. Author

N93-32244# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Bretigny sur Orge (France). Div. de Physiologie Metabolique et Hormonale.
PROTEIN REQUIREMENTS IN HYPOXIA OR HYPOKINESIA
C. Y. Guezennec, A. X. Bigard, and D. Taillandier *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 5 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A01/MF A03

Muscle trophicity is under the influence of four major factors which are nutrition, nervous stimulation, muscle activity, and hormones. Numerous works have shown that substrate availability acts directly on muscle protein synthesis. The glucidic and proteic substrates regulate in a coordinated way the muscle proteosynthesis so that the attention was focused on the role of protein nutriment to protect muscle against protein wasting. Several conditions could decrease protein body stores among which are hypoxia exposure or hypokinesia. Both environmental factors are results of aerospace or military events. Two studies were conducted in order to evaluate the role of protein diet on protein metabolism during hypokinesia or hypoxia exposure. Author

N93-32245# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.
NUTRITION FOR A TYPICAL MAC CREW DURING DESERT STORM
J. French and T. J. Cook *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 6 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A02/MF A03

Data on inflight meals were collected during a 30-day field experiment conducted by the Armstrong Laboratory designed to evaluate fatigue in C-141 Military Airlift Command (MAC) aircrew. Flight meal information was collected for one five-member crew throughout the area of operation during the last week of Desert Storm and for 3 additional weeks. Focus is on the nutritional components of a representative sample of the inflight meals provided to MAC aircrew. Nutritional analysis was based on fifteen in flight meals obtained from various Desert Storm staging bases. Analysis concerned kilocalories, protein, carbohydrate, fat, cholesterol, sodium, and saturated fats present in the average meal. The mean value for these components, constituting an average inflight meal, were 1758 Kcal, 53 g protein, 233 g carbohydrate, 66 g fat, 136 mg cholesterol, 3240 mg sodium and 20 g saturated fats. The limitations of this opportunistic evaluation and the need for additional field analyses of inflight meals and aircrew diets is discussed. Author

N93-32246# Institute of Aviation Medicine, Oslo (Norway).
CHANGES IN FOOD AND ENERGY INTAKE IN MILITARY AIRCREW
C. Helle, K. Kvamsoe, K. Trygg, and H. T. Andersen *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 7 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A02/MF A03

Military flying is a demanding profession requiring excellent performance during operations. Because the modern western society includes several undesirable lifestyle patterns, dietary counseling has been given increased attention over the past few years in Norway where the government has arrived at an official policy of nutritional standards. In order to provide information about the nutritional pattern of military aircrew, the Institute of Aviation Medicine (IAM) carried out a food survey on aircrew at Andoya Air Base in 1986. The present survey is a follow-up study of the 1986 study, using the same squadron and the same method as the previous study. Our survey has three aims. The first one is to detect any change in aircrew diet over the last six years. Secondly, since the 1986 survey showed that the aircrew took a nutritionally better diet than the average Norwegian population, it was investigated whether this group is still ahead. Finally, to what extent the irregular working and resting conditions of aircrew influence their meal schedule was studied. Author (revised)

N93-32247# Spanish Air Force, Talavera AFB.
TRIAL OF EMERGENCY RATION OF THE SPANISH AIR FORCE
Antonio Mendez Martin and Jose Ignacio Peralba Vano *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 8 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A02/MF A03

The response of normal young volunteers to the Spanish Air Force (SAF) Emergency Rations (ER) (NATO code 8.970-33G02-0140) as the only nutriment during seven consecutive days was tested. The nutritional and metabolic response plus the psychological acceptability of the ER was evaluated. All the volunteers were medical students who were fully informed about the trial and its conditions. Each proband received a daily diet with only ER (1.000 Kcal/day, 10 chewable bars/210 grms total weight) equivalent

to 580 Kcal/sqmeter/body surface/day with two optional flavors, orange or chocolate. Quantity of liquids per day/probands was from 1.5 to 2.0 liters. Probands carry out their normal daily activity without changes in usual timing except meals. The trial duration was 7 days. The conclusion was that the SAF ER provides satisfactory nutrition for short periods of time without impairing the daily activities or altering the metabolic and nutritional parameters in a normal young population. Author (revised)

N93-32248# Italian Air Force Pratica di Mare, Rome.
IDIOPATHIC REACTIVE HYPOGLYCEMIA IN A POPULATION OF HEALTHY TRAINEES OF AN ITALIAN AIR FORCE MILITARY SCHOOL
Stefano Farrace, Luca Urbani, Lorenzo Sakara, and Claudio DeAngelis *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 3 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A01/MF A03

Idiopathic Reactive Hypoglycemia (IRH) was investigated among a population of young trainees of an Italian Air Force military school. One hundred and twenty male healthy subjects underwent a 300 min Oral Glucose Tolerance Test (OGTT) after an overnight fasting. Nine out of 120 subjects (group A: 7.5 percent) showed a glycemia nadir below 50 mg/dl. Moreover, in group A eight out of nine subjects reported symptoms referable to clinical hypoglycemia during the glycemia nadir. Furthermore, a lack in glucagon response to hypoglycemia was observed in group A. Data are suggestive for the presence of Idiopathic Reactive Hypoglycemia in group A subjects. Data suggest that IRH may be considered relevant as a possible reason of in-flight accident due to human factor. Author (revised)

N93-32249# Service de Medecine Aeronautique, Versailles (France).
LIPODYSTROPHIES IN THE FRENCH MILITARY FLIGHT CREW [LES DYSLIPIDEMIES DANS LE PERSONNEL NAVIGANT MILITAIRE FRANCAIS] **c52**
A. Seigneuric, J. P. Burlaton, J. Deroche, R. Richard, and A. Boussif *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 5 p In FRENCH (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A01/MF A03

Disorders of the lipid metabolism in the French flight crew were evaluated beginning with a population having aeronautical expertise who were hospitalized between 1980 and 1989. An anomaly: -pure hypertriglyceridemy (hyper TGD) - mixed lipodystrophy - isolated hypercholesterolemy (hyper CT), were recognized in 52.3% of the cases (483/923). A hyper CT with an elevated risk was confirmed in 34.8% of the cases (294/923). It is in the group of controllers that this anomaly is th most frequent, with 40% of the subjects affected (50/120), whereas approximately 30% of the subjects are affected in the various groups of pilots as well as among the mechanics and navigators. The follow-up carried out for 177 flying personnel in an average period of two and a half years showed the existence of a cardiovascular attack for 12% of the subjects. Therapeutic treatment (diet +/- medication) was effective in 45% of the cases. The decrease in the numbers for cholesterol, the triglycerides, and for a multifactoral risk factor is established at around 10%. Transl. by FLS

N93-32250# Hellenic Air Force Aeromedical Center, Athens (Greece).
LIPIDEMIC PROFILE OF HELLENIC AIRFORCE OFFICERS **c52**
J. Palermos, A. Kitsou, S. Michalopoulou, and K. Kyriakos *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 4 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A01/MF A03

To gain a better insight into the lipidemic profile of our personnel, the serum concentration of total lipids, total cholesterol, triglycerides, phospholipids, high and low density cholesterol, A-1 and B apolipoproteins were measured chemically in 324 healthy ground officers. Additionally, the LDL cholesterol was estimated using the Friedewald's formula LDLfc = chol-HDLc-(trig/5). The population under study, randomly selected, consisted of male, ground officers in active duty serving in the Hellenic Airforce with similar socio-economic status, without any history of coronary heart disease or diabetes mellitus and not receiving any medication. They were grouped into three groups (n= 108) of 31-35, 36-40, and 41-45 years old. A statistically significant increase in the blood concentration of total cholesterol, triglycerides, LDL cholesterol, and apolipoproteinB were found in the 36-40 age group. A significant percentage of individuals in every age group had blood lipid concentrations (cholesterol 41.7 percent, LDL-cholesterol 51.9 percent, triglycerides 7.1 percent, apolipoprotein A-1 43.8 percent) exceeding the desirable levels that prevent an increased risk of a coronary heart disease. Estimated LDLfc values were higher than the measured ones, but from regression analysis, stronger relationship between LDLfc and total cholesterol was found. No correlation between HDLc and total cholesterol was found. Finally our results suggest that: (1) a high percentage of our ground personnel has blood lipid concentrations (principally chol, LDLc, ap-A1) exceeding the levels that prevent an increased risk of coronary heart disease (CHD); (2) people aged over 40 seem to be sufficiently aware of the risk of high blood lipid concentrations and this awareness has to be extended toward younger ages; (3) certain lipids (phos, HDLc, apo-A1) do not vary among the age groups studied and are possibly not discriminatory markers for the screening of lipidemic profile. Estimated LDLfc, though higher than the measured LDLc, showed stronger relationship with total cholesterol and under restrictions can be considered as trustworthy index of the lipidemic profile. Author (revised)

N93-32251# Royal Air Force Central Medical Establishment, London (England).
BLOOD LIPIDS IN AIRCREW RECRUITS AND IN RAF AVIATORS **c52**
D. H. Hull *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 8 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A02/MF A03

Blood cholesterol is a major indicator of cardiovascular risk, mainly from coronary artery disease. Blood lipid elevations are a common cause for referral of RAF aircrew for specialist assessment. The need for investigation, treatment (dietary, drugs), repeated counseling and indefinite follow-up constitutes a significant commitment. Blood lipids were measured in fasting male subjects from two groups; young recruits provisionally accepted for RAF flying training, and trained RAF aircrew. Mean blood cholesterols (SD's) were 4.65 (0.89) mmol/l (180 (34) mgm/dl) in recruits and 5.5 (1.14) mmol/l (213 (44) mgm/dl) in trained aircrew. Corresponding figures for triglycerides were 1.13 (0.56) mmol/l (100 (50) mgm/dl) in recruits and 1.46 (0.86) mmol/l (129 (76) mgm/dl). All differences between groups were significant (p is less than .001). Lipid levels were correlated with age in both groups. Blood lipid levels in recruits were in general satisfactory; the main purpose of measurement remains the detection of the occasional individual with a familial hyperlipidaemia. Blood cholesterols in trained aircrew, though lower than the average for British men, were above desirable limits in 50 percent of all aircrew tested. Ten percent were in the band requiring clinical care and 2 percent might require drug treatment. A program to reduce cardiovascular risk in RAF personnel will include dietary, exercise, and other measures. Author (revised)

N93-32252# Italian Air Force Pratica di Mare, Rome.
CARDIOVASCULAR RISK FACTORS IN AN ITALIAN AIR FORCE POPULATION: PRELIMINARY REPORT **c52**
S. Farrace, L. Sakara, L. Urbani, and C. DeAngelis *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 4 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A01/MF A03

Two hundred male subjects from an Italian Air Force AFB were admitted after informed consent to an epidemiological study on the diffusion of cardiovascular risk factors. They were divided in two groups: group A (n=150; aged 37.7 plus or minus 10.7 yr.) was personnel mainly employed in logistic and administrative activities, group B (n=50; aged 35.2 plus or minus 7.8) were pilots regularly performing flight activity. Each subject underwent a clinical examination, height and weight, resting ECG and blood pressure recording, as well as a 20 ml blood sampling. Measurement of total cholesterol, HDL cholesterol, glucose, uric acid, APO-A, APO-B, and Lp(a) lipoprotein concentration was carried out in each subject. Data showed that while lipid values and mean arterial pressure (MAP) levels are significantly lower in group B (p is less than 0.05) as compared to group A, APO A/B ratio and Lp(a) lipoprotein concentration are significantly higher (p is less than 0.05). These findings may suggest that, despite a lipid profile and mean MAP level within the physiological range and independently from these parameters, it may be recognizable in the pilot group a trend towards atherosclerosis development which needs to be further investigated. Author (revised)

N93-32253# Centro de Instruccion de Medicina Aeroespatial, Madrid (Spain).

CARDIOVASCULAR RISK FACTORS (CVRF) IN SPANISH PILOTS WITH CORONARY ARTERY DISEASE DEMONSTRATED BY ANGIOGRAPHIC STUDIES **c52**

M. A. Gomez-Marino, C. Alonso, and F. Rios *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 10 p (For primary document see N93-32240 12-54)

Copyright Avail: CASI HC A02/MF A03

During the years 1987-1991, 32 Spanish pilots with ages between 39 and 56 years (47.34 +/- 4.81) had demonstrated coronary obstructive lesions by means of coronary angiography. Each case was studied investigating separately, the following cardiovascular risk factors (CVRF) - cigarette smoking, hypercholesterolemia, hypertrigliceridemia, diabetes, arterial hypertension, obesity, and coronary disease family history. It was found that CVRF were present in all the Spanish pilots with proved coronary artery disease. 87.5 percent were heavy smokers and 68.5 percent had high levels of plasma cholesterol. The smoking habit was the most important single CVRF, even more than cholesterol high levels, but they may be relationed with the very high number of cigarettes smoked (33.2 +/- 11.5 for a period of 24.7 +/- 6.3 years). Other CVRF were of little value if not associated to hypercholesterolemia or smoking habit. A proper control of CVRF it should be a priority over the pilot population in order to increase flight safety and the efficiency of the air operations. Author (revised)

N93-32254# German Air Force, Fuerstenfeldbruk (Germany). Aviation Medicine Div.

RESULTS AND MANAGEMENT OF PATHOLOGICAL LIPOPROTEIN CONCENTRATIONS AND OTHER CARDIOVASCULAR RISK FACTORS IN MILITARY PILOTS OF THE GERMAN FEDERAL ARMED FORCES **c52**

Erich Roedig *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 8 p (For primary document see N93-32240 12-54)

Copyright Avail: CASI HC A02/MF A03

As a result of research findings during the past years, the level and type of circulating lipoprotein concentrations have become a subject of focal interest. It is now well established that high cholesterol levels are related to the extent and severity of arteriosclerotic heart disease. Before this background, the aeromedical physician is called upon to act now, considering the increased psychic and physical demands the new weapon systems will impose on the aviator. In a 4-year survey the lipoprotein concentrations of German military pilots were examined under standardized conditions, the results being evaluated in a statistical program at the German Air Force Institute of Aviation Medicine. Additional risk factors influencing the cardiovascular system are also mentioned. Cholesterol level is greater than 220 mg/dl and HDL cholesterol is less than 35 mg/dl are considered as pathological. This is true in 52.4 percent of German military pilots older than 41 years. In 1992, of all pilots (N=4563) examined, 37.2 percent show cholesterol levels greater than 220 mg/dl while 25.1 percent have a tot. chol./HDL-chol. ratio is greater than 6.0. These results differ from those in the years before. Therefore, besides dietary and physical fitness programs, a regime to reduce pathological lipoprotein concentrations will also be introduced. It is mandatory from an aeromedical point of view that risk factors and disorders of the cardiovascular system be detected by medical flying fitness examination. This particularly applies to silent cardiac ischemia. Author (revised)

N93-32255# Portuguese Air Force, Alfragide. Centro de Medicina Aeronautica.

NUTRITIONAL AND LIFESTYLE STATUS OF 50 PILOTS OF THE PORTUGESE AIR FORCE

F. B. Oliveira, N. L. Ribeiro, and S. R. Silveira *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 2 p (For primary document see N93-32240 12-54)

Copyright Avail: CASI HC A01/MF A03

A group of 50 pilots selected from a non-academic pilot background, born between 1947-1960, had their body weight, smoking and drinking habits, and blood pressure evaluated during a 10 year survey. Fifty six percent had Real Body Weight (RBW) greater than the Ideal Body Weight (IBW), with a 28 percent of RBW greater than + 10Kg of the IBW. Smoking habits were over 20 cigarettes per day in 36 percent and only 10 percent didn't smoke. Declared alcoholic intake, over average consumption, was admitted in 14 percent, with 3 alcoholic psychiatric treatment and 1 admission to hospital with Acute Alc. Hepatities. Blood pressure was over normal range in 12 percent. A modified clinical and Laboratorial screening is being applied, since 1991. Author (revised)

N93-32256# Hellenic Air Force General Hospital, Athens (Greece).

CORRELATION OF LIFE-STYLE AND DIETARY CONCOMITANTS OF GREEK PILOTS WITH SERUM ANALYTES

C. Daskalopoulos, J. Palermos, T. Zoga, A. Stavropoulos, and K. Kyriakos *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 4 p (For primary document see N93-32240 12-54)

Copyright Avail: CASI HC A01/MF A03

Certain serum analytes (glucose, total cholesterol, HDL cholesterol, triglycerides, uric acid, and y-glutamyltransferase) were correlated with some lifestyle variables (dietary features, anthropometrics, and physical exercise) in military (n=157) and civilian (n=157) male pilots in order to determine a possible relationship between these variables and their health status. The subjects, randomly selected within a certain period, were currently active without any history of coronary heart disease or diabetes mellitus and were not receiving any medication. In total, military pilots had statistically significant increased mean values of glucose, while a correlation of the mean values between groups with similar age showed that military pilots had increased cholesterol values and civilian pilots had increased triglycerides, LDL cholesterol, and y-GT values. Both had an average body mass index (weight/height(sup 2)) of 25 and very few of them were following an effective physical exercise program toward lowering cholesterol level. They preferred taking few (82.1 percent, 80.9 percent for military and civilian pilots respectively) but large meals (59.2 percent, 52.2 percent respectively). Concerning food composition, almost 30 percent of them were eating meals containing 38 percent or more fat, and 15 percent of them were eating meals with less than 44 percent carbohydrates of total daily caloric intake. Finally, our data suggest that: (1) the concentration of certain blood analytes (glucose, cholesterol) should be reduced, (2) an effective regular aerobic exercise program should be followed, and (3) meals should be altered toward the pattern of 'many and small' per day containing less fat and more carbohydrates. Author (revised)

N93-32257# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.

THE LIFESTYLE AND DIETARY CONSUMPTION PATTERNS OF UNITED STATES AIR FORCE AVIATORS WITHIN AIR TRAINING COMMAND AT RANDOLPH AIR FORCE BASE, TEXAS

Tammy J. Cook, Jonathan French, and Beth Senne-Duff (Incarnate Word Coll., San Antonio, TX.) *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 8 p (For primary document see N93-32240 12-54)

Copyright Avail: CASI HC A02/MF A03

A lifestyle survey was developed and distributed to two flying squadrons and to the rated officers of the 12th Flying Training Wing to examine lifestyle habits and dietary consumption patterns. Blood lipid profiles were gathered and classified using National Cholesterol Education Program (NCEP) guidelines. Eighty two of 100 surveys were returned, and 75 completed 24-hour dietary recalls. As a group, these surveyed aviators consumed significantly less total fat, saturated fat, and dietary cholesterol than found in the typical American diet. Ninety three percent were non-smokers and 16 percent did not drink alcohol. Twenty eight percent described themselves as overweight by 6-10 pounds. Sixty-two percent exercised aerobically with 56 percent exercising three times a week or more. Monitoring total blood cholesterol level was important to 86 percent of respondents. Using NCEP guidelines, 36 percent of randomly sampled aviators were identified with LDL cholesterol which may warrant dietary or lifestyle intervention. Future research efforts and a proposed approach for educational intervention are discussed for this population.

Author (revised)

N93-32258# Spanish Air Force, Talavera AFB.

OBJECTIVE IMPROVEMENTS OBTAINED BY CONTROL OF DIET AND PHYSICAL TRAINING IN SPANISH AIR FORCE FIGHTER PILOTS

Jose L. Garcia Alcon, Ma del Rosario Duran Tejeda (Extremadura Univ., Badajoz, Spain.), and Juan M. Moreno Vazquez (Extremadura Univ., Badajoz,

Spain.) *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 7 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A02/MF A03

The effect of diet and sport practice in a homogeneous--age, sex and environmental stress--group of pilots (n=90) was investigated in order to evaluate the impact of diet and sport practice on body weight and plasma lipid levels. The dietary intake was a typical mediterranean diet (55-60 percent carbohydrates, 25 percent lipids, and 15-20 proteins and 3000 Kcal daily). It was controlled by the Flight Surgeon Office. The sport practice was grounded in a physical training program for pilots, directed by the Physical Training Officer. A marked difference in all studied lipid parameters was found between groups with free diet versus controlled diet. A difference in HDL-C levels and TC/HDL-C ratio was found between groups with regular physical training versus free sport practice.

Author (revised)

N93-32259# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.

THE INFLUENCE OF DIETARY COUNSELING AND CARDIAC CATHETERIZATION ON LIPID PROFILES IN AMERICAN MILITARY AVIATORS

. Tuomala, R. Munson, W. Besich, and P. Celio *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 6 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A02/MF A03

The purpose was to determine the combined effect of dietary counseling and cardiac catheterization on lipid profiles when compared to a control group that did not receive dietary counseling or cardiac catheterization. The medical records and lipid profiles of 109 military aviators who underwent cardiac catheterization and dietary counseling and 109 matched controls who received neither were reviewed. All individuals were seen twice at the Aeromedical Consultation Service (ACS) between July 1987 and March 1992. Lipid profiles of the two groups were compared during their first evaluation and again at follow-up. Overall, there was a trend towards improvement in lipid profiles, but the changes between the 2 groups were not statistically significant. The cardiac catheterization group was divided into 3 subgroups based on severity of disease and compared to their matched control. The subgroup with minimal coronary artery disease (max lesion is less than 30 percent) showed a small but statistically significant improvement in HDL cholesterol. Otherwise the aviators knowledge of his angiographic results did not lead to any significant change in lipid profiles. This suggests that lipid profiles in aviators is not significantly affected by the combined influence of nutritional counseling and cardiac catheterization. The design of this study did not preclude members of either group from receiving dietary recommendations from physicians as part of their overall evaluation.

Author (revised)

N93-32260# Belgian Air Force, Brussels.

BIOLOGICAL PARAMETERS AND CARDIOVASCULAR RISK FACTORS WITH THE FLYING PERSONNEL OF THE BELGIAN ARMED FORCES

J.-P. Vastesaeger and P. Vandenbosch *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 3 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A01/MF A03

Research was done into biological parameters and cardiovascular risk factors of all pilots and navigators of the Belgian Armed Forces (Air Force and Light Aviation) of more than 45 years old and was evaluated according to age categories. The evolution of these data was analyzed with a retrograde study. Special attention was paid to the differences between Light Aviation and Air Force and between the respective linguistic groups.

Author (revised)

N93-32261# Royal Norwegian Air Force, Oslo.

CHANGES IN SOME LIFESTYLE PARAMETRES IN NORWEGIAN PILOTS AS STUDENTS, AND AFTER 6 AND 12 YEARS OF SERVICE

I. L. Neslein, C. C. Christensen, L. Lian, T. Rode, and H. T. Andersen *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 3 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A01/MF A03

Medical records from candidates accepted for military training in the Royal Norwegian Airforce (RNoAF) between 1978 to 1980, and who still are on flying standards in the RNoAF, were examined. Cholesterol, HDL-cholesterol, resting heart rate, blood pressure, body weight, and maximum oxygen uptake were studied over a 12 year period, i.e. at approximately 20, 26, and 32 years of age. Our pilots gain weight at a rate twice that of the general Norwegian population. They maintain the same physical fitness from the age of 20 to 26, and from 26 to 32 there is a significant increase in maximum oxygen uptake. A 32 year old pilot is in a distinctly better physical condition, both compared to his younger colleagues, and to the average Norwegian of the same age. There is also a significant increase in serum-cholesterol from the age of 20 to 32. HDL-cholesterol and resting heart rate remained unchanged over the period. Systolic blood pressure was unchanged from 20 to 26, but decreased significantly from 26 to 32. Diastolic blood pressure dropped significantly from 20 to 26 years of age. Dietary/lifestyle consultation, as a matter of routine, may be of great importance to young pilots in order to prevent coronary heart diseases in the future. Such information should be given at an early stage, before symptoms occur.

Author (revised)

N93-32262# Centro de Instruccion de Medicina Aeroespatial, Madrid (Spain).

SURVEY OF SMOKING HABITS IN THE SPANISH AIR FORCE

F. Rios Tejada, C. Alonso Rodriguez, J. J. Canton Romero, and J. A. Azofra Garcia *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 7 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A02/MF A03

Cigarette smoking is a well known cause of major illnesses in the general population, illnesses that can impair a pilot's performance of duty and even result in temporary or permanent disqualification of the aircrew member. This results in a diminished return on a significant investment of time and resources used to train the individual, a loss that is even more critical as the competition for such resources in an era of budget reduction, becomes more intense. The purpose is to review the diseases and physiologic changes related to cigarette smoking, especially as they relate to the flying environment. Then the prevalence of both the smoking habit and these related impairments in the Spanish Air Force aircrews are specifically examined. Finally, this data is utilized, compared to previous epidemiologic surveys in this target population, to draw conclusions regarding the effectiveness of past efforts at reducing cigarette smoking and propose future methods that might be used to reduce the negative impact of smoking related illness on the SAF mission.

Author (revised)

N93-32263# Army Natick Research and Development Command, MA.

THE EFFECTS OF AN ANTIJET LAG DIET

Charles A Salter, Laurie S. Lester, Edward Hirsch, Margaret Moline (Cornell Univ., White Plains, NY.), Charles P. Pollak (Cornell Univ., White Plains, NY.), and Daniel R. Wagner (Cornell Univ., White Plains, NY.) *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 13 p (For primary document see N93-32240 12-54)
Copyright Avail: CASI HC A03/MF A03

The unpleasant symptoms surrounding jet lag or phase shifts (fatigue, insomnia, etc.) generally interfere with biological rhythms, performance, and subjective well being. A popular 'jet lag diet' has been touted widely as an effective countermeasure to alleviate symptoms through systematic alternation of high (greater than 3600 calories per day) and low (less than 800 calories per day) food intake, timed consumption of methyl xanthines, high protein breakfasts and lunches, and high carbohydrate dinners. Unfortunately, this system as a whole has never been adequately tested with humans. Fifteen male subjects (aged 18-25) lived individually in time-isolation apartments for 15 consecutive days. For the first seven days they ate and slept according to their usual schedule. During the seventh night, they were phase advanced 6 hours, to simulate an easterly jet flight, and maintained their new schedules for 8 days. The eight control subjects consumed their normal diet throughout the study, while the seven diet group subjects consumed the 'jet lag diet' prescribed by Charles Ehret. All subjects experienced jet lag as evidenced by disrupted sleep and body temperature rhythms, mood and performance decrements, and lessened physical activity. The antijet lag diet did not lessen the severity of these symptoms and, in fact, worsened sleep. Although, the two groups did not differ with respect to sleep latency, duration, or composition before the simulated jet lag, afterwards subjects in the diet group slept on average 30 minutes less and were 31 percent less efficient than the control subjects.

These results indicate that a popular antijet lag diet is not effective in young male subjects and may even worsen symptoms for air crew members relying upon it. Author (revised)

N93-32264# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.

SUBJECTIVE MOOD AND FATIGUE OF C-141 CREW DURING DESERT STORM

Jonathan French, Patricia A. Boll, Roger U. Bisson, Kelly J. Neville, William F. Storm, Stephen H. Armstrong, Timothy Slater, and Robert L. McDaniel (Military Airlift Wing, 437th, Charleston AFB, SC.) *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 6 p (For primary document see N93-32240 12-54)

Copyright Avail: CASI HC A02/MF A03

Profile of Mood States (POMS) data were used to assess the subjective condition of C-141B air crew members during Operation Desert Storm (March/April, 1992). The POMS dimensions used were anger, fatigue, vigor, tension, depression, and confusion. Data were collected during 2 intervals of the MAC crew duty day; legal for alert (LFA) and crew rest (CR) intervals. The POMS dimensions correlated with one another during the 30-day study. Fatigue, vigor, and confusion were different between LFA and CR suggesting that the CR interval was restorative. During both LFA and CR intervals, cumulative flight hour blocks from 0-75, 76-100, 101-125, and 126-150 hours per month revealed no significant effects on subjective mood states. However, mood was sensitive to conditions of recent (1-2 days) flight hours and sleep hours in combination with cumulative flight hours per 30-days. In particular, when cumulative flight hours exceeded 125 hours per 30-day period, the vigor dimension was affected by the amount of sleep and flight hours in the most recent 24-48 period. Therefore, attending to recent sleep and flight hours as well as cumulative flight hours per 30-day interval may reduce fatigue and improve mood when operational pressures require exceeding the normal 125 flight hours per 30-days. Author (revised)

N93-32265# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.

C-141 AIRCREW SLEEP AND FATIGUE DURING THE PERSIAN GULF CONFLICT

Patricia A Boll, William F. Storm, Jonathan French, Roger U. Bisson, Stephen D. Armstrong, Timothy Slater, William E. Ercoline (Krug Life Sciences, Inc., San Antonio, TX.), and Robert L. McDaniel (Military Airlift Wing, 437th, Charleston AFB, SC.) *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 13 p (For primary document see N93-32240 12-54)

Copyright Avail: CASI HC A03/MF A03

Subjective fatigue ratings and sleep logs were collected from pilots flying C-141 strategic airlift missions during Operations Desert Shield and Desert Storm. Descriptive summaries of the data are presented for duty-day, crew rest away from home base, and crew rest at home base. The implications of selected findings are presented as recommendations on management of aircrew work/rest schedules during sustained airlift operations. Author

N93-32266# Army Aeromedical Research Lab., Fort Rucker, AL.

THE EFFECTS OF COCKPIT HEAT ON AVIATOR SLEEP PARAMETERS

J. Lynn Caldwell, Robert Thornton, Jacquelyn Y. Pearson, and Barbara L. Bradley *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 10 p (For primary document see N93-32240 12-54)

Copyright Avail: CASI HC A02/MF A03

Aviators are frequently required to work in hot environments while performing the complex cognitive tasks necessary to fly their aircraft. Objective measures of sleep were taken to determine the effects of exposure to high cockpit temperatures. Army helicopter pilots were required to fly a UH-60 simulator while wearing NBC IPE in temperatures of 35 C and 41 C. Additionally, various cooling vests were tested to determine if these cooling mechanisms would alleviate any heating effect seen in sleep parameters. During the day, pilots flew the simulator continuously for 6 h unless they were withdrawn because of excessive core temperature or they voluntarily withdrew. During the night, pilots slept in a cool bedroom in the laboratory while their sleep patterns were recorded by electroencephalography. Analyses of the data indicated when core body temperature rose during the flight by at least 1 C and the flight was at least 5 h in length, rapid eye movement (REM) sleep was significantly reduced. No rise in slow wave sleep (SWS) was seen although there was a tendency for the relationship between SWS and REM sleep to be altered. The results suggest aviators operating in a hot environment for a long period of time may have altered sleep the following night. Author (revised)

N93-32267# Centre National de la Recherche Scientifique, Paris (France).

HUMAN FACTORS AND THE SAFETY OF FLIGHTS: THE IMPORTANCE OF THE MANAGEMENT OF SLEEP [FACTEURS HUMAINS ET SECURITE DES VOLS: IMPORTANCE DE LA GESTION DU SOMMEIL]

P. Cabon, R. Mollard, A. Coblentz (Paris V Univ., France.), J. P. Fouillot (Paris V Univ., France.), and J. J. Speyer (Airbus Industrie, Toulouse, France.) *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 11 p In FRENCH (For primary document see N93-32240 12-54)

Copyright Avail: CASI HC A03/MF A03

In the field of civil air transport, the fatigue and sleep of the pilots becomes more and more of a concern in the area of flight safety, in particular for long distance flights. Indeed, these flights produce important stresses for the pilots: fast and multiple time shifts, work at night or with shifted schedules with occasionally very high amounts of work. The cumulated effect of these stresses involves disturbances of the circadian rhythms and sleep deprivations reducing the performance and the alertness level of the pilots. These difficulties are particularly elevated by the lengthening of the duration of flights with the modern planes such as the Boeing 747-400 and Airbus A340 (flights can attain a duration of 14 hours). These flights which remain for the moment limited to certain types of routes will tend to become more common in the near future. They are carried out with a reinforced crew, the French regulation of civil aviation prohibiting the work of pilots beyond one period of 8 or 10 hours according to the type of aircraft. The relatively recent appearance of these aircraft raises the very delicate question of the management of sleep for the whole crew, during the stopover and the flight. To these physiological constraints, it is necessary to add the modifications of the activity of piloting on the modern aircraft. Sometimes the increasing automation of the cockpits contributes to making the tasks of the pilot very monotonous as well as reducing the sensory stresses considerably. Similar work was also carried out in the military field. The cumulated action of these two factors, sleep disturbances and monotony of activity, are likely to involve states of hypovigilance which can appear, in certain circumstances, prejudicial to the safety of the flight. The results of research aimed at the study of the duration and quality of sleep of the crews of civil aircraft during rotations including long distance flights of durations equal to or greater than 8 hours. Transl. by FLS

N93-32268# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.

DIGITAL FLIGHT DATA AS A MEASURE OF PILOT PERFORMANCE ASSOCIATED WITH FATIGUE FROM CONTINUOUS OPERATIONS DURING THE PERSIAN GULF CONFLICT

Roger U. Bisson, Kelly J. Neville, Patricia A. Boll, Jonathan French, William R. Ercoline (Krug Life Sciences, Inc., San Antonio, TX.), Robert L. McDaniel (Military Airlift Wing, 437th, Charleston AFB, SC.), and William F. Storm *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 11 p (For primary document see N93-32240 12-54)

Copyright Avail: CASI HC A03/MF A03

The results of a field study using the C-141 Digital Flight Data Recorder (DFDR) to evaluate whether fatigue affected piloting precision during the Persian Gulf conflict are described. This is the first time digital flight data from the C-141 was used to evaluate routine aircrew performance. Five C-141 military transport crew were granted scheduling priority to quickly accumulate 150 flight hours in less than 30 days. Fatigue estimates were based upon activity logs, fatigue ratings, oral temperature, and mood surveys. Eighty seconds of the instrument landing system (ILS) final approach above decision height were isolated from digital flight data downloaded after each flight. Both an average and a standard deviation were calcualted for airspeed, heading, vertical velocity, pitch, and roll for each of the 80 second ILS segments. The standard deviations served as estimates of piloting precision and were correlated to fatigue measures. No significant

differences in piloting precision categorically attributable to fatigue were found. However, individual examples of decreased precision associated with high fatigue levels were observed. These deviations did not occur with enough regularity to conclude whether fatigue or other factors were the root cause. DFDR data can be a sensitive measure of performance, but the operational setting of Desert Storm did not permit control of important variables in this first time effort. The findings suggest that DFDR assessment of flying precision could be of value in controlled studies of fatigue, workload, or drugs that affect pilot performance. Future studies need to evaluate digital flight data versus other cognitive and psychomotor tasks that are sensitive to changes in performance. Transl. by FLS

N93-32269# Army Natick Research and Development Command, MA. Military Performance and Neuroscience Div.

EFFECTS OF CAFFEINE ON MENTAL PERFORMANCE AND MOOD: IMPLICATIONS FOR AIRCREW MEMBERS

Harris R. Lieberman, Bernard J. Fine, John L. Kobrick, and John D. E. Gabrieli (Stanford Univ., CA.) *In* AGARD, Nutrition, Metabolic Disorders and Lifestyle of Aircrew Mar. 1993 10 p (For primary document see N93-32240 12-54)

Copyright Avail: CASI HC A02/MF A03

Caffeine is generally regarded as the most widely used drug in the world. However, it is also a food constituent. Its acute effects on behavior appear to be greater than those of any other food constituent as they are detectable when caffeine is administered in doses found in single servings of coffee, tea, and soft drinks. Caffeine affects the central nervous system by binding to adenosine receptors, and it has acute and chronic, dose dependent effects on brain function. Low and moderate doses have beneficial effects on mental performance but high doses may have adverse effects. Tolerance develops to continued use of caffeine, so that its acute effects are altered when it is used chronically in high doses. Physical and mental symptoms associated with sudden withdrawal of caffeine have also been reported. The acute effects of caffeine on vigilance, simple and complex cognitive performance, and mood state are discussed. Doses equal to single servings of beverages consistently improve auditory and visual vigilance. In addition, moderate doses of caffeine increase self-reported alertness. The duration and magnitude of these effects on individuals are related to habitual caffeine consumption and interact with tobacco use. In view of its dose-related beneficial and deleterious effects, aircrew personnel, flight surgeons, military commanders, and planners should have knowledge of the potential influence of caffeine on performance, especially vigilance, and mood, as well as the consequences of its abrupt withdrawal.

Author (revised)

N93-32328*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

HEALTH MAINTENANCE FACILITY SYSTEM EFFECTIVENESS TESTING

Charles W. Lloyd, John Gosbee (Krug Life Sciences, Inc., Houston, TX.), Richard Bueker (Krug Life Sciences, Inc., Houston, TX.), Debra Kupra (Krug Life Sciences, Inc., Houston, TX.), and Mary Ruta (Krug Life Sciences, Inc., Houston, TX.) Jul. 1993 111 p

(NASA-TM-104737; S-638; NAS 1.15:104737) Avail: CASI HC A06/MF A02

The Medical Simulations Working Group conducted a series of medical simulations to evaluate the proposed Health Maintenance Facility (HMF) Preliminary Design Review (PDR) configuration. The goal of these simulations was to test the system effectiveness of the HMF PDR configurations. The objectives of the medical simulations are to (1) ensure fulfillment of requirements with this HMF design, (2) demonstrate the conformance of the system to human engineering design criteria, and (3) determine whether undesirable design or procedural features were introduced into the design. The simulations consisted of performing 6 different medical scenarios with the HMF mockup in the KRUG laboratory. The scenarios included representative medical procedures and used a broad spectrum of HMF equipment and supplies. Scripts were written and simulations performed by medical simulations working group members under observation from others. Data were collected by means of questionnaires, debriefings, and videotapes. Results were extracted and listed in the individual reports. Specific issues and recommendations from each simulation were compiled into the individual reports. General issues regarding the PDR design of the HMF are outlined in the summary report. Author (revised)

N93-32356*# Sverdrup Technology, Inc., Huntsville, AL.

MICROBIOLOGICAL AND CORROSION ANALYSIS OF THREE URINE PRETREATMENT REGIMES WITH TITANIUM 6A1-4V Interim Report

Timothy L. Huff Jul. 1993 26 p

(Contract NAS8-37814)

(NASA-CR-192575; NAS 1.26:192575) Avail: CASI HC A03/MF A01

One objective of the water recovery test (WRT) performed at NASA's Marshall Space Flight Center (MSFC) for the environmental control and life support systems (ECLSS) of Space Station Freedom is to determine the ability of the water recovery system to reclaim urine for crew reuse. In the process, raw urine is pretreated using a commercially available oxidant, Oxone (Dupont), and sulfuric acid (to reduce ammonia), and pumped into a urine processing subsystem. A combination of sodium hypochlorite and sulfuric acid were also considered as an alternative pretreatment. The ability of these pretreatments, plus a third pretreatment of ozone, to reduce microbial levels in urine generated during testing of the water recovery system at MSFC was examined. In addition, the corrosion rate of weld and base metal specimens of titanium 6A1-4V, a candidate material for the water system of Space Station Freedom, was monitored in the presence of these pretreatments. Specimen surfaces were examined at completion of the 21-day test using scanning electron microscopy. Change in pH, color, turbidity, and odor were recorded over the course of the test.

Author (revised)

N93-32406# Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil).

UTILIZATION OF HIGH ENERGY ELECTRON BEAM IN THE TREATMENT OF DRINKING AND WASTE WATER

Maria Helena deOliveiraSampa, S. I. Borrely, and D. M. Morita (Sao Paulo Univ., Brazil.) Aug. 1991 17 p Presented at the First Brazilian Meeting on Nuclear Applications, Recife, Brazil, 27-30 May 1991

(DE92-642335; IPEN-PUB-341; CONF-9105279) Avail: CASI HC A03/MF A01 (US Sales Only)

Samples of drinking water and waste water were irradiated using high energy electron beam with doses from 0.37 kGy to 100 kGy. Preliminary data show the removal of about 100% trihalomethanes (THM) in drinking water concentration from 2.7 micro-g/1 to 45 micro-g/1, 90% of the color of the Public Owned Wastewater Treatment Plant effluent and 87% of oil and grease of the cutting fluid waste water. DOE

N93-31456*# McDonnell-Douglas Space Systems Co., Huntington Beach, CA.

ATMOSPHERIC CONTROL SYSTEMS

Melanie Mankamyer *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 419-425 (For primary document see N93-31439 12-18)

Avail: CASI HC A02/MF A04

N93-31457*# McDonnell-Douglas Space Systems Co., Huntington Beach, CA.

ROTATIONAL SPEED CONTROL

Paul Bastin *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 427-434 (For primary document see N93-31439 12-18)

Avail: CASI HC A02/MF A04

N93-31458*# McDonnell-Douglas Space Systems Co., Huntington Beach, CA.

VIBRATION ISOLATION

Paul Bastin *In its* Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 435-443 (For primary document see N93-31439 12-18)

Avail: CASI HC A02/MF A04

N93-31573*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

PROBABILISTIC SIMULATION OF THE HUMAN FACTOR IN STRUCTURAL RELIABILITY

Ashwin R. Shah (Sverdrup Technology, Inc., Brook Park, OH.) and Christos C. Chamis *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 159-168 (For primary document see

N93-31552 12-20)
Avail: CASI HC A02/MF A03

N93-32106*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MAN-MACHINE COOPERATION IN ADVANCED TELEOPERATION
Paolo Fiorini, Hari Das, and Sukhan Lee *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 87-93 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32107*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
INTEGRATION OF ADVANCED TELEOPERATION TECHNOLOGIES FOR CONTROL OF SPACE ROBOTS
Michael J. Stagnaro *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 94-103 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32108*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INTERACTIVE AND COOPERATIVE SENSING AND CONTROL FOR ADVANCED TELEOPERATION
Sukhan Lee *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 104-115 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

N93-32112*# Naval Command, Control and Ocean Surveillance Center, Kailua, HI.
TELEOPERATOR/TELEPRESENCE SYSTEM (TOPS) CONCEPT VERIFICATION MODEL (CVM) DEVELOPMENT
Mike S. Shimamoto *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 149-155 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32151*# Air Force Systems Command, Brooks AFB, TX.
A PRELIMINARY EMPIRICAL EVALUATION OF VIRTUAL REALITY AS AN INSTRUCTIONAL MEDIUM FOR VISUAL-SPATIAL TASKS Abstract only
J. Wesley Regian, Wayne Shebilske, and John M. Monk (Galaxy Scientific Corp., Lackland AFB, TX.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 406 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

N93-32152*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
A DECISION-THEORETIC APPROACH TO THE DISPLAY OF INFORMATION FOR TIME-CRITICAL DECISIONS: THE VISTA PROJECT
Eric Horvitz (Rockwell International Science Center, Palo Alto, CA.), Corinne Ruokangas (Rockwell International Science Center, Palo Alto, CA.), Sampath Srinivas (Rockwell International Science Center, Palo Alto, CA.), and Matthew Barry *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 407-41 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

55 SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N93-31087# Hungarian Academy of Sciences, Budapest. Szamitastechnikai es Automatizalasi Kutat o Intezete.
SYMPOSIUM ON APPLIED MATHEMATICAL PROGRAMMING AND MODELING (APMOD93): VOLUME OF EXTENDED ABSTRACTS
Istvan Maros 8 Jan. 1993 646 p Symposium held in Budapest, Hungary, 6-8 Jan. 1993
(Contract DAJA45-93-M-0131)
(AD-A264091) Avail: CASI HC A99/MF A06

A partial listing of the contents of this document is as follows: Implementing a Maximum Flow Algorithm; Experiments with Dynamic Trees; On Decomposition of Dual Variables in Linear Programming and its Economic Interpretation; Graph-Based Modeling with MIMI/G; Impact of Quantitative Methods on Logical Interference Problem; and Scheduling Multiprocessors Tasks on a Dynamic Configuration of Dedicated Processors. DTIC

60 COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware, and data processing.

For components see *33 Electronics and Electrical Engineering.*

N93-31649*# Old Dominion Univ., Norfolk, VA. Dept. of Electrical and Computer Engineering.
DESIGN AND IMPLEMENTATION OF FUZZY LOGIC CONTROLLERS Thesis Final Report, 27 Jul. 1992 - 1 Jan. 1993
Osama A. Abihana and Oscar R. Gonzalez Jul. 1993 173 p
(NASA Order L-20278-D)
(NASA-CR-193268; NAS 1.26:193268) Avail: CASI HC A08/MF A02

The main objectives of our research are to present a self-contained overview of fuzzy sets and fuzzy logic, develop a methodology for control system design using fuzzy logic controllers, and to design and implement a fuzzy logic controller for a real system. We first present the fundamental concepts of fuzzy sets and fuzzy logic. Fuzzy sets and basic fuzzy operations are defined. In addition, for control systems, it is important to understand the concepts of linguistic values, term sets, fuzzy rule base, inference methods, and defuzzification methods. Second, we introduce a four-step fuzzy logic control system design procedure. The design procedure is illustrated via four examples, showing the capabilities and robustness of fuzzy logic control systems. This is followed by a tuning procedure that we developed from our design experience. Third, we present two Lyapunov based techniques for stability analysis. Finally, we present our design and implementation of a fuzzy logic controller for a linear actuator to be used to control the direction of the Free Flight Rotorcraft Research Vehicle at LaRC. Author (revised)

N93-31849*# Auburn Univ., AL. Dept. of Computer Science and Engineering.
ASSESSMENT OF A HUMAN COMPUTER INTERFACE PROTOTYPING ENVIRONMENT Final Report, 8 Mar. - 15 May 1993
Loretta A. Moore 15 Jul. 1993 29 p
(Contract NAS8-39131)
(NASA-CR-192612; NAS 1.26:192612; CSE-93-08) Avail: CASI HC A03/MF A01

A Human Computer Interface (HCI) prototyping environment with embedded evaluation capability has been successfully assessed which will be valuable in developing and refining HCI standards and evaluating program/project interface development, especially Space Station Freedom on-board displays for payload operations. The HCI prototyping environment is designed to include four components: (1) a HCI format development tool, (2) a test and evaluation simulator development tool, (3) a dynamic, interactive interface between the HCI prototype and simulator, and (4) an embedded evaluation capability to evaluate the adequacy of an HCI based on a user's performance. Author (revised)

N93-32233*# Illinois Univ., Urbana-Champaign. Center for Reliable and High-Performance Computing.
EXPERIMENTAL ANALYSIS OF COMPUTER SYSTEM DEPENDABILITY
Ravishankar Iyer, K. and Dong Tang Jun. 1993 118 p
(Contracts NAG1-613; N00014-91-J-1116; N00014-90-J-1270)
(NASA-CR-193401; NAS 1.26:193401; UILU-ENG-93-2227; CRHC-93-15)
Copyright Avail: CASI HC A06/MF A02

This paper reviews an area which has evolved over the past 15 years: experimental analysis of computer system dependability. Methodologies and advances are discussed for three basic approaches used in the area: simulated fault injection, physical fault injection, and measurement-based analysis. The three approaches are suited, respectively, to dependability evaluation in the three phases of a system's life: design phase, prototype phase, and operational phase. Before the discussion of these phases, several statistical techniques used in the area are introduced. For each phase, a classification of research methods or study topics is outlined, followed by discussion of these methods or topics as well as representative studies. The statistical techniques introduced include the estimation of parameters and confidence intervals, probability distribution characterization, and several multivariate analysis methods. Importance sampling, a statistical technique used to accelerate Monte Carlo simulation, is also introduced. The discussion of simulated fault injection covers electrical-level, logic-level, and function-level fault injection methods as well as representative simulation environments such as FOCUS and DEPEND. The discussion of physical fault injection covers hardware, software, and radiation fault injection methods as well as several software and hybrid tools including FIAT, FERARI, HYBRID, and FINE. The discussion of measurement-based analysis covers measurement and data processing techniques, basic error characterization, dependency analysis, Markov reward modeling, software-dependability, and fault diagnosis. The discussion involves several important issues studies in the area, including fault models, fast simulation techniques, workload/failure dependency, correlated failures, and software fault tolerance.
Dissert. Abstr.

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, alogorithms, and specific applications, e.g., CAD/CAM.

N93-31054# Oxford Univ. (England). Robotics Research Group.
A DESIGN FOR A VISUAL MOTION TRANSDUCER
A. Blake, G. Hamid, and L. Tarassenko Oct. 1992 29 p
(OUEL-1960/92; ETN-93-94232) Avail: CASI HC A03/MF A01

Two explanations for the operation of the conventional grating transducer design are given: one is algebric, in terms of signal processing theory; the other is graphical, illustrating filtering operations in the spatio-temporal frequency domain. The grating principle is illustrated by the fact that a man with a torch, walking at night behind a railing, seems to flash. The frequency of flashing is proportional to his velocity. A major drawback is that backward and forward motion are not distinguished. The key development is the use of computation as a means of modulating the grating output signal. This is equivalent to simulating stroboscopic motion of the railing. Thus, when the man is stationary, there is flashing at a resting frequency. When he moves one way the frequency increases, and for motion the opposite way, frequency decreases. Results from analog implementation of the visual motion transducer are presented. The current transducer measures translational motion across the grating. The design is shown to be capable of extension to direct measurement of the divergence and curl of the flow field. ESA

N93-31055# Oxford Univ. (England). Robotics Research Group.
A FRAMEWORK FOR SPATIO-TEMPORAL CONTROL IN THE TRACKING OF VISUAL CONTOURS
A. Blake, R. Curwen, and A. Zisserman Oct. 1992 28 p Sponsored by United Kingdom Science and Engineering Research Council, EEC, and Oxford Metrics, England
(OUEL-1961/92; ETN-93-94233) Avail: CASI HC A03/MF A01

Elastic models and stochastic filtering are combined with the notion of affine invariance to synthesize a substantially new and demonstrably effective framework for contour tracking. A mechanism is developed for incorporating a shape template into a contour tracker via an affine invariant coupling. In that way, the tracker becomes selective for shape and able to ignore background clutter. Affine invariance ensures that the effect of varying viewpoint is accommodated. Use of a standard statistical filtering framework allows uncertainties to be treated systematically, which accomodates object flexibility and unmodeled distortions. The statistical framework also facilitates a further developmment. In place of heuristically determined spatial scale for feature search, both spatial scale and temporal memory are controlled automatically and in a way that is reponsive to the tracking process. The tracker operates initially in a coarse scale/short memory mode while it searches for a feature. Then spatial scale diminishes to allow more precise localization whilst memory lengthens to take advantage of motion coherence. All system parameters are determined by natural assumptions and desired tracking performance, leaving none to be fixed heuristically. Versions of the tracker were implemented at video rate, both on SUN4 and in parallel, using a network of 11 Transputers. The theoretically established properties of automatic control of spatiotemporal scale and of affine invariance are demonstrated using the implemented tracker. ESA

N93-31112# National Inst. of Standards and Technology, Gaithersburg, MD.
COBOL COMPILER VALIDATION SYSTEM (CCVS 85), USER GUIDE, VERSION 4.2
25 May 1993 312 p Prepared in cooperation with National Computing Centre Ltd., Manchester, England
(PB93-163178; NIST/SW/MT-93/003A) Avail: CASI HC A14/MF A03

The report is a comprehensive user guide for the COBOL 85 Compiler Validation System. It gives a brief description of each test program and supplies information on running the tests and interpreting the results. The validation system is used to validate COBOL compilers to ensure their conformance to the Federal standard as prescribed in Federal Information Processing Standards (FIPS) PUB 21-3 and the International Organization for Standardization (ISO) Standard 1989:1985. It consists of approximately 300 COBOL programs, each of which contains several independent tests.
NTIS

N93-31126# Oxford Univ. (England). Robotics Research Group.
A THEORY OF PLANAR GRASP
Andrew Blake Oct. 1992 36 p Sponsored by United Kingdom Science and Engineering Research Council, and EEC
(OUEL-1958/92; ETN-93-94230) Avail: CASI HC A03/MF A01

A theory for identification and classification of two fingered grasps is demonstrated. Optimal finger positions are obtained from the pairwise intersections of three subsets in the configuration space of the gripper. The sets are: the symmetry and antisymmetry sets, and a third set, the critical set of the grasp map. The three sets themselves form boundaries in a natural partition of configuration space. The partition corresponds to a classification of possible grasps according to their stability properties. An implementation of the theory was developed for an ADEPT robot with visual sensing. ESA

N93-31151# Oxford Univ. (England). Robotics Research Group.
EXTRACTING PROJECTIVE INFORMATION FROM SINGLE VIEWS OF 3D POINT SETS
C. A. Rothwell, D. A. Forsyth, A. Zisserman, and J. L. Mundy Apr. 1992 14 p
(OUEL-1927/92; ETN-93-94226) Avail: CASI HC A03/MF A01

The construction of projective invariants for structured three dimensional point sets is investigated. It is shown how to cage points within a polyhedral structure and then introduce indexing functions for polyhedra. The index measures are projective and so no knowledge of the intrinsic parameters of the camera are required. This also enables full use of the perspective imaging model to be used. The results are preliminary, and only introduce the constructs for forming the invariants. The examples of the invariant measures are for synthetic projections of simple polyhedra. Future work will test the paradigm thoroughly in real objects and images. ESA

N93-31152# Oxford Univ. (England). Dept. of Engineering Science.
AN EFFICIENT CONSTRAINED PREDICTIVE CONTROL ALGORITHM FOR 2-INPUT SYSTEMS

Keck-Voon Ling 1992 23 p Sponsored by Building Research Establishment, United Kingdom, and Committee of Vice-Chancellors and Principals, United Kingdom
(OUEL-1946/92; ETN-93-94227) Avail: CASI HC A03/MF A01

A multivariable constrained predictive controller based on the generalized predictive control approach is formulated. The quadratic cost function used includes a term involving the full value of the control signal. This is in anticipation of applications where the control objective is to minimize the control energy instead of the control activity. Incremental model is used in the prediction equation to reduce the effect of steady state offset. A special case of 2 input/1 input system is treated in detail and a simple solution which avoids the quadratic programming solution is obtained. The algorithm also gives an interpretation to the sequencing and range splitting control strategies often found in industrial controllers. ESA

N93-31183# Sandia National Labs., Albuquerque, NM.
THE PERFORMANCE OF PAGOSA ON SEVERAL MIMD PARALLEL COMPUTERS
D. R. Gardner, D. D. Cline, and C. T. Vaughan 1992 13 p Presented at the 1992 Nuclear Explosives Code Developers Conference, Sunnyvale, CA, 2-6 Nov. 1992
(Contract DE-AC04-76DP-00789)
(DE93-003243; SAND-92-1880C; CONF-9211128-1) Avail: CASI HC A03/MF A01 (US Sales Only)

A message-passing implementation of a single-material version of the PAGOSA hydrocode which was ported to several multiple-instruction, multiple-data stream (MIMD) parallel computers, was developed. PAGOSA is a three-dimensional, multimaterial, Eulerian, data-parallel hydrocode developed at LANL for the Connection Machine-2. Our code approximates the behavior of the multimaterial version and so provides a useful tool for performance measurements. The performance of our MIMD version of PAGOSA on the nCUBE 2, the CM-5, and the Intel DELTA parallel computers. Our measurements are based on the simulation of a three-dimensional blast wave, and show that the unoptimized, message-passing version can run more than twice as fast as the same code running on a single processor of a Cray Y-MP for simulations with a million computational cells or more. DOE

N93-31199 Massachusetts Inst. of Tech., Cambridge. Sea Grant Coll.
CUT LOCUS AND MEDIAL AXIS IN GLOBAL SHAPE INTERROGATION AND REPRESENTATION
F. E. Wolter 1993 48 p See also PB89-109136 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant NA90AA-D-SG424)
(PB93-189884; MITSG-93-11) Avail: CASI HC A03

The cut locus C sub A of a closed set A in the Euclidean space E is defined as the closure of the set containing all points p which have at least two shortest paths to A. The author presents a theorem stating that the complement of the cut locus is the maximal open set in (E(backwards slash)A) where the distance function with respect to the set A is continuously differentiable. This theorem includes also the result that this distance function has a locally Lipschitz continuous gradient on (E(backwards slash)A). The medial axis of a solid D in E is defined as the union of all centers of all maximal discs which fit in this domain. The author assumes in the medial axis case that D is closed and that the boundary of D is a topological (not necessarily connected) hypersurface of E. Under these assumptions the author proves that the medial axis of D equals that part of the cut locus of boundary of D which is contained in D. NTIS

N93-31200# National Inst. of Standards and Technology, Gaithersburg, MD. Computer Systems Lab.
BUILDING HADAMARD MATRICES IN STEPS OF 4 TO ORDER 200
N. Drouin Apr. 1993 22 p
(PB93-189835; NISTIR-5121) Avail: CASI HC A03/MF A01

Based on methods of construction described in 1978, the programs described allow one to build Hadamard matrices of order up to 200, in steps of 4. These matrices are to be used to generate statistical plans of analysis for the 'Synthetic Perturbation Tuning' technique of program sensitivity analysis. NTIS

N93-31205# Institut National Polytechnique, Grenoble (France). Lab. d'Informatique Fondamentale et d'Intelligence Artificielle.
ON THE INTEGRATION OF ALGEBRAIC AND LOGIC LANGUAGES Ph.D. Thesis [SUR L'INTEGRATION DES LANGAGES ALGEBRIQUES ET LOGIQUES]
Rachid Echahed 1990 160 p In FRENCH
(ETN-93-94238) Avail: CASI HC A08/MF A02

An approach to the integration of logic and functional programming languages based on Horn clause logic with equality is presented. The programs considered are syntactically defined as theory presentations in the framework of Horn clause logic with equality. The semantic of a program is its least Herbrand E-model. The computational aspects of this language, and a deductive system consisting of a unique rule called SLDEI resolution are presented. The soundness, the completeness, and the strong completeness of this rule are discussed. Implementations of SLDEI resolution lean on algorithms of resolution of equations. Algorithms based on narrowing relationship are considered and narrowing strategies are used. These strategies are not complete in general, so conditions in these strategies that ensure the completeness of the algorithms are proposed. A class of programs, called uniform programs is characterized so that any narrowing strategy leads to a complete algorithm of resolution of equations. A procedure for deciding whether or not a program is uniform is presented and syntactical criteria that warrant the uniformity of programs are given. The main features of a programming language, based on the approach presented are reviewed. ESA

N93-31248# Instituto de Engenharia Nuclear, Rio de Janeiro (Brazil).
QUASAR: AN INTERACTIVE PROGRAM FOR SPECTRUM ANALYSIS IN PERSONAL COMPUTERS
L. T. Auler and J. A. W. Nobrega Nov. 1991 31 p
(DE93-609814; IEN-27/91) Avail: CASI HC A03/MF A01 (US Sales Only)

The QUASAR software for the interactive analysis and report of energy (pulse-height) and time (multichannel scaling) spectra is described. The operating instructions as well as the mathematical methods and algorithms used by the program are presented in detail. This program is an extension to the PULSAR program. DOE

N93-31249 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.
SPATIAL RELATIONAL ALGEBRA: AN EXTENDED RELATIONAL ALGEBRA FOR SPATIAL DATABASE
A. Belussi, M. Negri, and G. Pelagatti Jul. 1992 55 p
(Rept-92-051; ETN-93-93988) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

The extension of the classical relational model by adding spatial domains and spatial operations is proposed. Special attention is given to these operations. One of the problems in the database research area is the extension of actual data models in order to deal with complex data, required in geographical applications. These applications need to store and manipulate large amounts of spatial information, that is, information composed of descriptive and geometrical data. The goal is to point out a set of operations applied to relations, called spatial relational algebra, which should play, in this model, the same role that the classical relational algebra played in the relational model. The proposed model provides a rigorous definition of objects contained in spatial domains. The implications of inserting these new domains in relations are presented. ESA

N93-31250 Politecnico di Milano (Italy). Dipt. di Elettronica.
ALGODESK: AN EXPERIMENTAL COMPARISON OF EIGHT EVOLUTIONARY HEURISTICS APPLIED TO THE QAP PROBLEM
Alberto Colorni, Marco Dorigo, and Vittorio Maniezzo Jul. 1992 26 p
(Rept-92-052; ETN-93-93989) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

Nine evolutionary heuristic algorithms applied to Quadratic Assignment Problem (QAP) are compared. A software system, ALGODESK, was developed. It allows applying any of the heuristics to any of the problem instances and analyzing the resulting output in a unified context. A synoptic table showing the results achieved by each algorithm in each instance is given. The purpose of the comparison is not to determine the best result achievable, but at the assessment of their efficiency in yielding good solution.

For this reason, raw data consist in the best solution produced by each algorithm in one hour run on identical machines. ESA

N93-31252 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.
ASSURING TYPE SAFETY OF OBJECT-ORIENTED LANGUAGES
Alberto Coen-Porisini, Luigi Lavazza (Master School CEFRIEL, Milan, Italy.), and Roberto Zicari (Johann-Wolfgang-Goethe-Univ., Frankfurt am Main, Germany.) Oct. 1992 19 p Sponsored in part by CNR and Commission of the European Communities
(Rept-92-061; ETN-93-93992) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

A technique called Type Data Flow (TDF), based on data flow analysis, is presented. The technique detects all possible anomalies that can result in a run time type error. The TDF technique is a pessimistic one and some of the detected anomalies may not result in an actual run-time type error. Moreover, if no anomalies are detected during the analysis of a program then no run time type error can occur during its execution. By means of several examples written, in Eiffel and C++ languages and known to obtain anomalies leading to run time type errors, the workability of TDF is demonstrated. ESA

N93-31337# Royal Signals and Radar Establishment, Malvern (England).
Z THROUGH PICTURES
G. P. Randell Mar. 1992 47 p
(RSRE-Memo-4587; BR-311135; ETN-93-93788) Copyright Avail: CASI HC A03/MF A01

Diagrams which may be generated from a Z specification either fully automatically or with human intervention are proposed. The main purpose of such diagrams is to illustrate the specification and thus help a reader to understand it and to validate it. Examples of the diagrams proposed are given. ESA

N93-31466 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.
DERIVING INCREMENTAL PRODUCTION RULES FOR DEDUCTIVE DATA
Stefano Ceri (International Business Machines Corp., San Jose, CA.) and Jennifer Widom (International Business Machines Corp., San Jose, CA.) Nov. 1992 31 p
(Rept-92-081; ETN-93-94004) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

It is demonstrated that the production rule mechanism provided by active database systems can be used to easily and efficiently implement the logic rule interface of deductive database systems. Deductive rules specify derived relations using Datalog with built in predicates and stratified negation; the deductive rules are compiled automatically into production rules. A materialized approach, in which the derived relations are stored in the database and the production rules automatically and incrementally propagate base relation changes to the derived relations is presented. A non-materialized approach in which the production rules compute the derived relations on demand is included. ESA

N93-31472# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
DIAC AT TWI
Afke vanRijn, Ruud Sommerhalder, Jurgen Stigter, and Paul vanderWeerd 1992 42 p
(Rept-92-77; ETN-93-94270) Copyright Avail: CASI HC A03/MF A01

Work on the DIAC project is reported. This project aims to develop, within four years, leading edge methods, tools, and techniques for flexible assembly systems that are capable of producing a wide range of products, stemming from different product families, and in small batches down to size one. In order to show the feasibility of the new developments, an 'intelligent' assembly cell will be built, the adequate operation of which will be demonstrated by the successful assembly of a number of different industrial products. The following are described: natural language in DIAC; the DIAC control system; and error management in DIAC. ESA

N93-31474# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
AN EXTENDED ALGORITHM FOR PERFORMANCE EVALUATION OF TIMED EVENT GRAPHS
J. G. Braker 1992 19 p
(Rept-92-75; ETN-93-94268) Copyright Avail: CASI HC A03/MF A01

An efficient algorithm, created by Karp, for performance evaluation of timed event graphs with only unit delays is extended to include a broader class of timed event graphs with more general delays. The algorithm uses a length matrix along with the weight matrix. It is shown that the extended algorithm is more efficient than Karp's algorithm, when combined with a reduction method in which graphs are reduced by systematically removing as many arcs as possible. The new algorithm is not only compared with Karp's method, but also with two other methods involving linear programming. ESA

N93-31478# Amsterdam Univ. (Netherlands). Dept. of Computational Linguistics.
A FORMAL DISCOURSE GRAMMAR TACKLING VERB PHRASE ANAPHORA
Hub Pruest, Remko Scha, and Martin vandenBerg Oct. 1991 50 p
(CL-91-03; ETN-93-94133) Avail: CASI HC A03/MF A01

An argument that an adequate treatment of Verb Phrase Anaphora (VPA) must depart in two major respects from the standard approaches is presented. VP anaphors cannot be resolved by simply a syntactic/semantic parallelism between larger units (sentences or discourse constituent units) that the VP's occur in. Secondly, discourse structure has a significant influence on the possibilities of VPA. This influence must be accounted for. A treatment which fulfills these desiderata is proposed. It builds on a discourse grammar incorporating a syntactic/semantic matching procedure that is used to recognize parallel structures in discourse. It turns out that this independently motivated procedure yields the resolution of VPA as a side effect. ESA

N93-31479# Amsterdam Univ. (Netherlands). Dept. of Mathematics and Computer Science.
REASONING ABOUT TERMINATION OF PROLOG PROGRAMS
Krzysztof R. Apt (Center for Mathematics and Computer Science, Amsterdam, Netherlands.) and Dino Pedreschi (Pisa Univ., Italy.) Dec. 1991 42 p Sponsored by EEC, and CNR
(CT-91-12; ETN-93-94134) Avail: CASI HC A03/MF A01

A theoretical basis for studying termination of (general) logic programs with the PROLOG selection rule is presented. To this end, the class of 'left terminating' programs is studied. These are logic programs that terminate with the PROLOG selection rule for all ground goals. A characterization of left terminating positive programs is offered by means of the notion of an 'acceptable program' that provides a practical method of proving termination. The method is illustrated by giving a simple proof of termination of the quicksort program for the desired class of goals. This approach is extended to the class of general logic programs by modifying the concept of acceptability. Acceptable general programs are proved to be left terminating. The converse implication does not hold but it is shown that under the assumption of non-floundering from ground goals every left terminating general program is acceptable. Various ways of defining semantics are shown to coincide for acceptable general programs. The use of this extension is illustrated by giving simple proofs of termination of a 'game' program and the transitive closure program for the desired class of goals. ESA

N93-31486# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
PROCESSOR-MANAGEMENT IN DISTRIBUTED SYSTEMS WITH A COMPUTE-INTENSIVE WORKLOAD
D. H. J. Epema 1992 23 p Sponsored by IBM Corp., Yorktown Heights, NY, and IBM, Netherlands
(Rept-92-52; ETN-93-94244) Copyright Avail: CASI HC A03/MF A01

An important resource in distributed systems is CPU (Central Processing Unit) time, for the management of which clear objectives and good metrics are needed. For such workloads, delivery of predefined shares of the total compute power to groups of related jobs is a much more natural objective. In order to measure CPU usage and judge compliance of scheduling policies with this objective, the concept of rate of delivery is proposed. Definitions and properties of rate of delivery are given, measurements are shown,

problems with evaluating policies trying to achieve target rates of delivery (called share scheduling policies) are indicated, and heuristics for such policies are proposed. ESA

N93-31495# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

HYBRID RENDERING OF SCIENTIFIC DATA USING AN H-BUFFER

Theo vanWalsum and Andrea J. S. Hin 1992 15 p Original contains color illustrations

(Rept-92-68; ETN-93-94260) Copyright Avail: CASI HC A03/MF A01

A method for hybrid visualization of various types of scientific data is presented. Hybrid visualization is performed by rendering each type of data into a hybrid buffer (h buffer), that contains, for every pixel, a depth sorted list of objects. The architecture of the h buffer system is described, including ways to render line, polygon and volume data into the buffer, merging of objects into a final pixel color and a way to combine volume ray casting with color merging. An example of data visualized with this system is shown. ESA

N93-31506# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

IMPLEMENTATIONS OF THE DOUBLE DOT PARSING ALGORITHM

A. F. Roelofs and J. P. M. deVreught 1992 26 p

(Rept-92-73; ETN-93-94265) Copyright Avail: CASI HC A03/MF A01

An attempt at parallelizing a parse algorithm called double dot is summarized. Part of the formal language theory consists of the recognition of natural languages. Recognition is a validity check of a piece of text. For instance the recognition of an English sentence would be testing if the sentence is correct English. The problem with solving the recognition problem in natural languages is that most of the algorithms tend to be slow. A solution to this problem could be the use of parallel machines for the algorithms. Two parallel algorithms were proposed that used the double dot parse algorithm. The first algorithm proved to be not feasible to finish. The second implementation was implemented and tested, though the results lead to the conclusion that neither one is useful for further examination. The main problem encountered was the way communication between the parallel nodes used for the computation has to be done. A more efficient way of inter-node communication would greatly increase the performance of the developed programs. ESA

N93-31511# Universiteit Twente, Enschede (Netherlands). Tele-Informatics and Open Systems Group.

DESIGN AND IMPLEMENTATION STRATEGIES

Jeroen Schot (ITA B.V., Enschede, Netherlands.) and Luis FerreiraPires 18 Aug. 1992 39 p Revised

(MEMO-INF-92-57; TIOS-92-25; ETN-93-93210) Copyright Avail: CASI HC A03/MF A01

An overview of design and implementation strategies for distributed information systems developed in the scope of the Lotosphere design methodology is given. Two subphases in the activity of producing an implementation of a distributed information system for a high level architectural design are identified. Relevant design problems for each subphase are then recognized, which allows the characterization of alternative design and implementation strategies to address these design problems. One of these implementation strategies is further illustrated by means of a simple design example: a sliding window protocol. The structuring of the implementation phase, the use of correctness preserving transformations, and the requirements for the elaboration of the final implementation are discussed. ESA

N93-31517# Amsterdam Univ. (Netherlands). Dept. of Computational Linguistics.

KOHONEN FEATURE MAPS IN NATURAL LANGUAGE PROCESSING

J. C. Scholtes Oct. 1991 35 p Sponsored by MSC Beheer B.V., Amsterdam, Netherlands

(CL-91-01; ETN-93-94131) Avail: CASI HC A03/MF A01

A recurrent self organizing model (based on an extension of the Kohonen feature map), which is capable of deriving contextual (and some semantical) information from scratch is presented. The model implements a first step towards an overall unsupervised language learning system. Simple linguistic tasks such as single work clustering (representation on the map), syntactical group formation, derivation of contextual structures, string prediction, grammatical correctness checking, word sense disambiguation and structure assigning are carried out in a number of experiments. The performance of the model is at least as good as achieved in recurrent backpropagation, and at some points even better (for example, unsupervised derivation of word classes and syntactical structures). Although premature, the first results are promising and show possibilities for other even more biologically inspired language processing techniques such as real Hebbian, Genetic and Darwinistic models. Further research must overcome limitations still present in the extended Kohonen model, such as the absence of within layer learning, restricted recurrence, no look-ahead functions (absence of distributed or unsupervised buffering mechanisms) and a limited support for an increased number of layers. ESA

N93-31528# Amsterdam Univ. (Netherlands). Dept. of Mathematics and Computer Science.

OBJECT ORIENTED APPLICATION FLOW GRAPHS AND THEIR SEMANTICS

Erik deHaas and Peter vanEmdeBoas 25 Feb. 1992 23 p

(CT-92-01; ETN-93-94135) Avail: CASI HC A03/MF A01

Two principles that are present in software development are combined: application flow graphs and object oriented programming/design. Both principles originated from a practical approach to software development, and not from some mathematical concept. A language called OOAFG (Object Oriented Application Flow Graphs) that bears the main features of both principles is constructed. A formal semantics for that language is provided because it is thought that the only way a language can be defined and claims can be made about that language is when the meaning of that language is unambiguously given by a formal system. ESA

N93-31529# Amsterdam Univ. (Netherlands). Dept. of Mathematics and Computer Science.

WEAK EQUIVALENCE: THEORY AND APPLICATIONS

Karen L. Kwast and Sieger vanDenneheuvel Jul. 1992 25 p

(CT-92-02; ETN-93-94136) Avail: CASI HC A03/MF A01

A generalization of the classical notion of implication, called 'weak implication' is studied. It extends unquantified predicate logic with a single level of 'existential quantification'. A sound and complete set of deduction rules for weak implications is presented. The notion of weak implication was introduced for the sake of a formal specification of a 'symbolic constraint solving' system. Other practical 'applications' can be found in the realm of relational database theory: query normalization and integrity constraints in the context of views. ESA

N93-31532# Amsterdam Univ. (Netherlands). Dept. of Mathematics and Computer Science.

A NOTE ON DYNAMIC ARROW LOGIC

Johan vanBenthem Sep. 1992 20 p Submitted for publication

(LP-92-11; ETN-93-94139) Avail: CASI HC A03/MF A01

A system of arrow logic with both first order relational operations and infinitary Kleene iteration, which may be a good candidate for the computational core calculus, is presented. In particular, completeness is proved for its minimal version, and various connections with propositional dynamic logic and categorial logics are established. The general issue raised is the following: What is genuine 'computation' and what is 'extraneous mathematics' in the logical analysis of programming and its semantics?. If the former component could be isolated, many different technical results in the current literature might be separable into different computational content plus a repetition of essentially the same mathematical overhead. No general solution to this question is offered but some general awareness of the phenomenon is advocated. ESA

N93-31548# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

PERFORMANCE OF SCANLINE-ORIENTED CSG DIRECT DISPLAY ALGORITHMS

Reinier vanKleij and Willem F. Bronsvoort 1993 35 p

(Rept-93-03; ETN-93-94298; AD-A258533) Copyright Avail: CASI HC A03/MF A01

CSG (Constructive Solid Geometry) direct display algorithms display a CSG model without first converting the model into a boundary representation. Three such algorithms are described. All three are based on the scanline display algorithm, and are able to handle both polygonal and quadratic

faces. The first algorithm is a recursive subdivision scanline algorithm, the second a combination of a scanline and a ray casting algorithm, and the third a scanline based version of a depth-buffer algorithm. A multiprocessor system in which these algorithms can be incorporated is also described. The performances of the algorithms are compared. It turns out that the algorithms are efficient display algorithms for general purpose architectures. A comparison is also made between the performances for polygonal models and quadratic models, to get an indication of how many polygons can at most be used to approximate quadratic surfaces and still have better performance. Some speculations on future performances of CSG direct display algorithms are made. ESA

N93-31614# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

GRAPH THEORETIC METHODS FOR THE COMPUTATION OF DISTURBANCE DECOUPLING FEEDBACK MATRICES FOR STRUCTURED SYSTEMS

J. W. vanderWoude 1992 19 p

(Rept-92-54; ETN-93-94246) Copyright Avail: CASI HC A03/MF A01

Structured systems for which the disturbance decoupling problem is known to be generically solvable are considered. It is recalled how this generic solvability is in one-one correspondence with certain properties of the graph representing the structure of the system. A graph oriented method is derived for the efficient computation of a feedback that actually solves the disturbance decoupling problem. It is believed that the method is especially useful in the case of sparse system matrices. ESA

N93-31617# Universiteit Twente, Enschede (Netherlands). Dept. of Computer Science.

ON THE SELECTION OF AN OPTIMAL SET OF SECONDARY INDICES

Sunil Choenni, Henk M. Blanken, and Thiel Chang (Gemeenschappelijk Administratiekantoor, Amsterdam, Netherlands.) Nov. 1992 30 p

(MEMO-INF-92-68; ETN-93-94110) Copyright Avail: CASI HC A03/MF A01

An important problem in the physical design of databases is the selection of secondary indices. In general, this problem can not be solved in an optimal way due to the complexity of the selection process. Often use is made of heuristics such as the well known ADD and DROP algorithms. A study where it is shown that frequently used cost functions can be classified as super or submodular functions is presented. For these functions several mathematical properties which reduce the complexity of the index selection problem were derived. These properties are used to develop a tool for physical database design and a mathematical foundation for the success of the ADD and DROP algorithms is given. ESA

N93-31629# Groningen Rijksuniv. (Netherlands). Computing Science Section.

COMPUTERIZED TOMOGRAPHY AND ITS APPLICATIONS: A GUIDED TOUR

J. B. T. M. Roerdink 1992 28 p

(CS-9206; ETN-93-94096) Avail: CASI HC A03/MF A01

A review of the mathematical principles of computerized tomography is presented. Topics treated include the role of the radon transform and related transforms, inversion formulas, uniqueness, ill posedness and stability, practical reconstruction algorithms, and various generalizations such as diffraction tomography. References to the most relevant literature are cited. Several applications are discussed; in particular, a case study of a mathematical problem arising in cardiac magnetic resonance imaging is presented. ESA

N93-31631# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

TAPES, QUEUES AND COMMUNICATING AUTOMATA IN DIAC

R. Sommerhalder and P. R. vanderWeerd 1992 25 p

(Rept-92-94; ETN-93-94283) Copyright Avail: CASI HC A03/MF A01

A study which defines the wheel machine to be a finite state machine equipped with a single queue is presented. Wheel machines are shown to be equivalent with Turing machines. In the DIAC project the dispatching of tasks is implemented using models of devices consisting of finite state machines that have individual mailboxes. A precise definition of mailbox automata and of the class L(sub M) of all languages that can be accepted by mailbox automata is given. Some properties of these languages are given. It is shown that these mailboxes can be used as queues, in this way showing that the dispatcher model, which consists of a set of communicating mailbox automata, is Turing complete. ESA

N93-31632# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

FRACTAL IMAGE CODING TECHNIQUES AND CONTRACTION OPERATORS

T. J. Bedford, F. M. Dekking, and M. S. Keane 1992 37 p

(Rept-92-93; ETN-93-94282) Copyright Avail: CASI HC A03/MF A01

Some of the problems involved with any implementation of Barnsley's fractal image coding methods are discussed. The idea of using fractals to achieve compression of the data in an image was popularized by Barnsley and his coworkers. An alternative fractal coding technique due to Jacquin (working under Barnsley) is also discussed. ESA

N93-31637*# Alabama Univ., Huntsville. Center for Applied Optics.

SOFTWARE TO MODEL AXAF IMAGE QUALITY Final Report, 1 May 1992 - 29 Jun. 1993

Anees Ahmad Jun. 1993 318 p

(Contract NAS8-38609)

(NASA-CR-192574; NAS 1.26:192574) Avail: CASI HC A14/MF A03

This draft final report describes the work performed under this delivery order from May 1992 through June 1993. The purpose of this contract was to enhance and develop an integrated optical performance modeling software for complex x-ray optical systems such as AXAF. The GRAZTRACE program developed by the MSFC Optical Systems Branch for modeling VETA-I was used as the starting baseline program. The original program was a large single file program and, therefore, could not be modified very efficiently. The original source code has been reorganized, and a 'Make Utility' has been written to update the original program. The new version of the source code consists of 36 small source files to make it easier for the code developer to manage and modify the program. A user library has also been built and a 'Makelib' utility has been furnished to update the library. With the user library, the users can easily access the GRAZTRACE source files and build a custom library. A user manual for the new version of GRAZTRACE has been compiled. The plotting capability for the 3-D point spread functions and contour plots has been provided in the GRAZTRACE using the graphics package DISPLAY. The Graphics emulator over the network has been set up for programming the graphics routine. The point spread function and the contour plot routines have also been modified to display the plot centroid, and to allow the user to specify the plot range, and the viewing angle options. A Command Mode version of GRAZTRACE has also been developed. More than 60 commands have been implemented in a Code-V like format. The functions covered in this version include data manipulation, performance evaluation, and inquiry and setting of internal parameters. The user manual for these commands has been formatted as in Code-V, showing the command syntax, synopsis, and options. An interactive on-line help system for the command mode has also been accomplished to allow the user to find valid commands, command syntax, and command function. A translation program has been written to convert FEA output from structural analysis to GRAZTRACE surface deformation file (.dfm file). The program can accept standard output files and list files from COSMOS/M and NASTRAN finite analysis programs. Some interactive options are also provided, such as Cartesian or cylindrical coordinate transformation, coordinate shift and scale, and axial length change. A computerized database for technical documents relating to the AXAF project has been established. Over 5000 technical documents have been entered into the master database. A user can now rapidly retrieve the desired documents relating to the AXAF project. The summary of the work performed under this contract is shown. Author (revised)

N93-31638*# Rensselaer Polytechnic Inst., Troy, NY. Center for Intelligent Robotic Systems for Space Exploration.

A COMPARISON OF FORCE CONTROL ALGORITHMS FOR ROBOTS IN CONTACT WITH FLEXIBLE ENVIRONMENTS

Lee S. Wilfinger Dec. 1992 154 p

(Grant NAGw-1333)

(NASA-CR-193251; NAS 1.26:193251; RPI-CIRSSE-135) Avail: CASI HC A08/MF A02

In order to perform useful tasks, the robot end-effector must come into contact with its environment. For such tasks, force feedback is frequently

used to control the interaction forces. Control of these forces is complicated by the fact that the flexibility of the environment affects the stability of the force control algorithm. Because of the wide variety of different materials present in everyday environments, it is necessary to gain an understanding of how environmental flexibility affects the stability of force control algorithms. This report presents the theory and experimental results of two force control algorithms: Position Accommodation Control and Direct Force Servoing. The implementation of each of these algorithms on a two-arm robotic test bed located in the Center for Intelligent Robotic Systems for Space Exploration (CIRSSE) is discussed in detail. The behavior of each algorithm when contacting materials of different flexibility is experimentally determined. In addition, several robustness improvements to the Direct Force Servoing algorithm are suggested and experimentally verified. Finally, a qualitative comparison of the force control algorithms is provided, along with a description of a general tuning process for each control method.
Author (revised)

N93-31656# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
FRACTAL CODING OF MONOCHROME IMAGES
T. J. Bedford, F. M. Dekking, M. Breeuwer, M. S. Keane, and D. vanShooneveld 1992 19 p
(Rept-92-99; ETN-93-94288) Copyright Avail: CASI HC A03/MF A01

Fractal techniques are used by a number of authors to code monochrome images. An investigation of a version of the technique proposed by Jacquin is presented. A number of extensions are made to his coding scheme, and in particular it is shown that the requirement on contractivity can be considerably weakened, leading to a coding scheme which preserves high frequencies much better than that proposed by Jacquin. ESA

N93-31659# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
PRIMAL-DUAL ALGORITHMS FOR LINEAR PROGRAMMING BASED ON THE LOGARITHMIC BARRIER METHOD
B. Jansen, C. Roos, T. Terlaky, and J.-P. Vial (Geneva Univ., Switzerland.) 1992 29 p
(Contract OTKA-2116; NWO-611-304-028; FNSRS-12-26434.89)
(Rept-92-104; ETN-93-94293) Copyright Avail: CASI HC A03/MF A01

Primal-dual interior point methods for solving the linear programming problem are addressed. A short step and a long step path following primal-dual method is presented and polynomial time bounds for both methods are derived. The iteration bounds are as usual in the existing literature, namely O((the square root of n)(L)) iterations for the short step, and O(nL) for the long step variant. In the analysis of both variants, a proximity measure, which is closely related to the Euclidean norm of the scaled search direction vectors is used. The analysis of the long step method strongly depends on the fact that the (usual) search directions form a descent direction for the so called primal-dual logarithmic barrier function. ESA

N93-31735 National Physical Lab., Teddington (England). Information Technology and Computing Div.
VDM SPECIFICATION OF THE SECURE HASH ALGORITHM
Andrew Harry Dec. 1992 34 p
(NPL-DITC-212/92; ETN-93-94030) Copyright Avail: Issuing Activity (National Physical Lab., Teddington, Middlesex, TW11 0LW, England)

A formal description of the Secure Hash algorithm in the notation of the Vienna Development Method (VDM) is given. The Secure Hash algorithm is a message digest algorithm capable of producing a 160 bit identifier or fingerprint from a message of a length less than 2 to the 26th power bits. The value produced is called the message digest, and when applied in digital signature scheme can be used to ensure that a message has not been tampered with between transmission and reception. The specification was translated from an informal natural language specification, and it is shown how the expression in a formal notation can expose possible ambiguities in the natural language. ESA

N93-31738*# Old Dominion Univ., Norfolk, VA. Dept. of Computer Science.
DEVELOPMENT OF A CASE TOOL TO SUPPORT DECISION BASED SOFTWARE DEVELOPMENT Annual Progress Report, period ending 31 Mar. 1993
Christian J. Wild Jul. 1993 151 p
(Grant NAG1-1426)
(NASA-CR-193289; NAS 1.26:193289) Avail: CASI HC A08/MF A02

A summary of the accomplishments of the research over the past year are presented. Achievements include: made demonstrations with DHC, a prototype supporting decision based software development (DBSD) methodology, for Paramax personnel at ODU; met with Paramax personnel to discuss DBSD issues, the process of integrating DBSD and Refinery and the porting process model; completed and submitted a paper describing DBSD paradigm to IFIP '92; completed and presented a paper describing the approach for software reuse at the Software Reuse Workshop in April 1993; continued to extend DHC with a project agenda, facility necessary for a better project management; completed a primary draft of the re-engineering process model for porting; created a logging form to trace all the activities involved in the process of solving the reengineering problem, and developed a primary chart with the problems involved by the reengineering process. Author (revised)

N93-31793 Carnegie-Mellon Univ., Pittsburgh, PA. Software Engineering Inst.
FORMAL SPECIFICATION AND VERIFICATION OF CONCURRENT PROGRAMS Final Report
Daniel M. Berry Feb. 1993 106 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F19628-90-C-0003)
(AD-A265201; CMU/SEI-CM-27-1.0) Avail: CASI HC A06

This module introduces formal specification of concurrent software and verification of the consistency between concurrent programs and their specifications. First, what one might want to be able to prove about a concurrent program is discussed. Then, a number of formal descriptions of the concept are presented. These vary in their coverage of the phenomena, and some can be used as the bases of formal specification of programs. Next, techniques for carrying out the proof of consistency between the specification and the program are described. Finally, it is noted that some of these techniques have automated tools such as verifiers associated with them. DTIC

N93-31850# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
THE Delfi3 DEBUGGER: NOTES ON THE IMPLEMENTATION
Bob Goedhart 1992 14 p
(Rept-92-106; ETN-93-94295) Copyright Avail: CASI HC A03/MF A01

The knowledge engineering environment Delfi3 is a general purpose environment for the development of large and complex knowledge based systems. Its knowledge representation language, LORE, combines the representation formalisms of frames, production rules, and logic programming. In addition, advanced techniques such as strong typing, multiple inheritance, and modularization are supported. The Delfi3 environment consists of a compiler, a linker, a maker, and an interpreter for this representation language. Thus far, Delfi3 lacked a run time debugger, which sometimes made life hard for application programmers. For this reason, a run time debugger that allows the application programmer to take a close look at the interpretation process was developed. The implementation of the debugger is reported. ESA

N93-31852# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
REVISION BY EXPANSION IN LOGIC PROGRAMS
Cees Witteveen and Catholijn Jonker (Utrecht State Univ., Netherlands.) 1993 44 p
(Rept-93-02; ETN-93-94297) Copyright Avail: CASI HC A03/MF A01

The semantics of general logic programs with constraints are discussed and the Well Founded (WF) semantics are extended to this class of programs. The well founded model of such programs may be contradictory due to a clash between the assumption made in the WF model to consider unfounded atoms to be false and the repercussions constraints can have

on this assumption. In case the WF model is contradictory, the contradiction can be removed by adding rules to unfounded atoms in the program, and it is proposed to use the noncontradictory WF model of such an 'expansion' as the semantics of the original program. Expansions are related to (the outcome of) 'belief revision processes' such as dependency directed backtracking in truth maintenance and contradiction removal in auto-epistemic logic. Here, interest is in 'expansion functions' returning expansions for programs in a given class of programs. It is shown that there exist easy to compute 'complete' expansion functions, that is, functions which provide an expansion whenever it is possible to give one. It is also shown that every expansion function can be simulated by a function belonging to a regular class, the so called class of 'simple' expansion functions. This result makes it possible to concentrate on complete simple expansion functions to study properties of arbitrary expansion functions. ESA

N93-32000# Carnegie-Mellon Univ., Pittsburgh, PA. Software Engineering Inst.
AN OVERVIEW OF PCTE: A BASIS FOR A PORTABLE COMMO N TOOL ENVIRONMENT Final Report
Fred Long and Ed Morris Mar. 1993 57 p
(Contract F19628-90-C-0003)
(AD-A265202; CMU/SEI-93-TR-01; ESC-TR-93-175) Avail: CASI HC A04/MF A01

Environment framework technologies are generating enormous interest as mechanisms to aid in the construction of software engineering environments populated with integrated CASE tools. PCTE, a framework technology, is generating significant interest among environment users and builders as a mechanism for data management. DTIC

N93-32007# Software Productivity Solutions, Inc., Indialantic, FL.
SYSTEM ENGINEERING CONCEPT DEMONSTRATION, SECURITY STUDY, VOLUME 7 Final Report, Feb. 1990 - Jul. 1992
Miguel A. Carrio, Jr. Dec. 1992 78 p
(Contract F30602-90-C-0021)
(AD-A265473; TR-92-345-Vol-7) Avail: CASI HC A05/MF A01

The effective implementation of a SECD security program, that insures the proper protection of classified and sensitive information, begins by addressing the subject of security early in the life cycle of the objective system. Security issues that are addressed well into the implementation phase; or those that are addressed after the fact, will result in certainty of compromise of the system information. Similarly, investigations of enabling technologies that support system implementation are not only required but should also be initiated early in the system life cycle. The investigations and technology incursions are needed to establish the feasibility and viability of the security measures needed, to provide the required degree of protection. Additionally, in any security implementation program, schedule consideration must be taken into account for the lengthy technology certification times. DTIC

N93-32022# Software Productivity Solutions, Inc., Indialantic, FL.
SYSTEM ENGINEERING CONCEPT DEMONSTRATION, EFFORT SUMMARY, VOLUME 1 Final Report, Feb. 1990 - Jul. 1992
Edward R. Comer and Sharon L. Rohde Dec. 1992 124 p
(Contract F30602-90-C-0021)
(AD-A265467; TR-92-345-Vol-1) Avail: CASI HC A06/MF A02

The objective of this effort is to demonstrate the concept of an advanced computer-based environment of integrated software tools and methods which supports the Air Force computer-based system (i.e., software, firmware, and hardware) life cycle - short of actual hardware fabrication. The intent of the environment is to provide integrated, state of the art engineering and development capabilities throughout the complete system life cycle. System requirements/design and software requirements of the system engineering and development environment shall be developed and documented. Demonstrations of technologies which are critical to establishing a system engineering and development environment capability shall be provided. DTIC

N93-32023# Software Productivity Solutions, Inc., Indialantic, FL.
SYSTEM ENGINEERING CONCEPT DEMONSTRATION, SYSTEM ENGINEERING NEEDS, VOLUME 2 Final Report, Feb. 1990 - Jul. 1992
Edward R. Comer Dec. 1992 142 p
(Contract F30602-90-C-0021)
(AD-A265468; TR-92-345-Vol-2) Avail: CASI HC A07/MF A02

The document is organized as follows: (1) Introduction; (2) Needs Survey; (3) Field Interviews; and (4) Conclusions. The needs survey investigated the problems with mission-critical systems development and maintenance, and the field interviews were conducted with practicing systems engineers; their findings present information concerning important systems engineering issues. The overall needs conclusions are presented in the final section. DTIC

N93-32024# Software Productivity Solutions, Inc., Indialantic, FL.
SYSTEM ENGINEERING CONCEPT DEMONSTRATION, INTERFACE STANDARDS STUDIES, VOLUME 4 Final Report, Feb. 1990 - Jul. 1992
J. K. Grau, Edward R. Comer, and Sharon Rohde Dec. 1992 156 p
(Contract F30602-90-C-0021)
(AD-A265470; TR-92-345-Vol-4) Avail: CASI HC A08/MF A02

This document contains background information about interface terminology, models, criteria, and evaluations of the standards. The organization of this document's discussion is as follows: (1) Interface Terminology; (2) Interface Model; (3) Framework Interface Standards--User interfaces, Communications, Repositories; (4) Tool Interface Standards; and (5) Virtual Machine Interface Standards. DTIC

N93-32034 Kaman Sciences Corp., Colorado Springs, CO.
VALIDATION OF SURVIVABILITY VALIDATION PROTOCOLS Technical Report, 1 May - 31 Aug. 1992
Thomas A. Stringer 1 May 1993 26 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DNA001-89-C-0080)
(AD-A264402; DNA-TR-92-131) Avail: CASI HC A03

Issues associated with the validation of survivability protocols are discussed. Both empirical and analytical approaches to protocol validation are included. The use of hybrid simulations (hardware-in-the-loop, scene generators, software generators, man-in-the-loop, etc.) for the validation of survivability protocols is discussed. DTIC

N93-32044# Carnegie-Mellon Univ., Pittsburgh, PA. School of Computer Science.
THE PRIORITY INVERSION PROBLEM AND REAL-TIME SYMBOLIC MODEL CHECKING
Sergio V. Champos 23 Apr. 1993 24 p
(Contract MDA972-90-C-0035)
(AD-A265408; CMU-CS-93-125) Avail: CASI HC A03/MF A01

Priority inversion is a serious problem that can make real time systems unpredictable in subtle ways. This makes it more difficult to implement and debug such systems. Our work discusses this problem and presents one possible solution. The solution is formalized and verified using temporal logic model checking techniques. In order to perform the verification, the BDD-based symbolic model checking algorithm given in previous works was extended to handle real-time properties using the bounded until operator. We believe that this algorithm, which is based on discrete time, is able to handle many real-time properties that arise in practical problems. DTIC

N93-32059# Kestrel Inst., Palo Alto, CA.
KNOWLEDGE-BASED SOFTWARE DEVELOPMENT TOOLS
Douglas R. Smith and Thomas T. Pressburger Sep. 1993 32 p
(Contracts N00014-84-C-0473; N00014-81-C-0582)
(AD-A265218; KES-U-87-6) Avail: CASI HC A03/MF A01

We describe some of the experimental knowledge-based software development tools under development at Kestrel Institute. In particular, systems for automatically performing algorithm design, deductive inference, finite differencing, and data structure selection are discussed. A detailed case study is presented that shows how these systems could cooperate in supporting the transformation of a formal specification into efficient code. The example treated is a schedule optimization problem. DTIC

N93-32066 Carnegie-Mellon Univ., Pittsburgh, PA. School of Computer Science.
A NEW DEFINITION OF THE SUBTYPE RELATION
Barbara Liskov and Jeannette M. Wing Apr. 1993 22 p Limited Reproducibility: More than 20% of this document may be affected by

microfiche quality
(Contracts N00014-91-J-4136; F33615-90-C-1465; ARPA Order 7597)
(AD-A265548; CMU-CS-93-149) Avail: CASI HC A03

The use of hierarchy is an important component of object-oriented design. Hierarchy allows the use of type families, in which higher level supertypes capture the behavior that all of their subtypes have in common. For this methodology to be effective, it is necessary to have a clear understanding of how subtypes and supertypes are related. This paper presents a new definition of the subtype relation that ensures that any property proved about supertype objects also holds for subtype objects. It also discusses the ramifications of the definition on the design of type families. DTIC

N93-32096# Colorado State Univ., Fort Collins. Dept. of Mathematics.
PARAMETRIC AND COMBINATORIAL PROBLEMS IN CONSTRAINED OPTIMIZATION Final Report, 1 Mar. 1990 - 28 Feb. 1993
Aubrey B. Poore 28 Feb. 1993 25 p
(Grant AF-AFOSR-0138-91)
(AD-A265595; AFOSR-93-0403TR) Avail: CASI HC A03/MF A01

The data association problem in multi-target tracking has been formulated and solved as a multidimensional assignment problem. Extensive simulations have been performed to demonstrate speed and robustness of these algorithms. DTIC

N93-32185# Japan Atomic Energy Research Inst., Tokyo.
A PLOTTING SYSTEM FOR THREE-DIMENSIONAL OBLIQUE COORDINATES (TRIANGULAR MESH) OF CITATION
Masayoshi Kurosawa (Japan Atomic Energy Research Inst., Tokai.) Feb. 1992 62 p
(DE92-526848; JAERI-M-92-007) Avail: CASI HC A04/MF A01

A plotting system, which is able to plot the results obtained by three-dimensional oblique coordinates (triangular mesh) CITATION calculations was developed. In this system, subroutines for transformation from oblique coordinates to rectangular coordinates were added to the current plot programs for XYZ rectangular coordinates of CITATION. By this modification, calculated results of three-dimensional oblique coordinates CITATION calculations are easily represented. DOE

N93-32239*# Illinois Univ., Urbana. Dept. of Electrical and Computer Engineering.
IMPLEMENTATION OF INTERCONNECT SIMULATION TOOLS IN SPICE
H. Satsangi and J. E. Schutt-Aine Aug. 1993 182 p
(Grant NAG2-823)
(NASA-CR-193619; NAS 1.26:193619; UILU-ENG-93-2559; ECL-93-4)
Avail: CASI HC A09/MF A02

Accurate computer simulation of high speed digital computer circuits and communication circuits requires a multimode approach to simulate both the devices and the interconnects between devices. Classical circuit analysis algorithms (lumped parameter) are needed for circuit devices and the network formed by the interconnected devices. The interconnects, however, have to be modeled as transmission lines which incorporate electromagnetic field analysis. An approach to writing a multimode simulator is to take an existing software package which performs either lumped parameter analysis or field analysis and add the missing type of analysis routines to the package. In this work a traditionally lumped parameter simulator, SPICE, is modified so that it will perform lossy transmission line analysis using a different model approach. Modifying SPICE3E2 or any other large software package is not a trivial task. An understanding of the programming conventions used, simulation software, and simulation algorithms is required. This thesis was written to clarify the procedure for installing a device into SPICE3E2. The installation of three devices is documented and the installations of the first two provide a foundation for installation of the lossy line which is the third device. The details of discussions are specific to SPICE, but the concepts will be helpful when performing installations into other circuit analysis packages. Author

N93-32299# Los Alamos National Lab., NM.
GENETIC ALGORITHMS FOR DNA SEQUENCE ASSEMBLY
R. Parsons, C. Burks, and S. Forrest (New Mexico Univ., Albuquerque.) 13 Apr. 1993 13 p Presented at the 1st International Conference on Intelligent Systems for Molecular Biology, Washington, DC, 7-9 Jul. 1993
(Contract W-7405-eng-36)
(DE93-012708; LA-UR-93-1647; CONF-930745-1) Avail: CASI HC A03/MF A01

This paper describes a genetic algorithm application to the DNA fragment assembly problems. The genetic algorithm uses a random key representation for representing the orderings of fragments. Two different fitness functions, both based on pairwise overlap strengths between fragments, were tested. The paper concludes that the genetic algorithm is a promising method for fragment assembly problems, achieving usable solutions quickly, but that the current fitness functions are flawed and that other representations might be more appropriate. DOE

N93-32322*# Ohio State Univ., Columbus.
FEED-FORWARD VOLUME RENDERING ALGORITHM FOR MODERATELY PARALLEL MIMD MACHINES Final Report
Roni Yagel Jul. 1993 14 p
(Grant NGT-26-027-011)
(NASA-CR-191158; E-7907; NAS 1.26:191158) Avail: CASI HC A03/MF A01

Algorithms for direct volume rendering on parallel and vector processors are investigated. Volumes are transformed efficiently on parallel processors by dividing the data into slices and beams of voxels. Equal sized sets of slices along one axis are distributed to processors. Parallelism is achieved at two levels. Because each slice can be transformed independently of others, processors transform their assigned slices with no communication, thus providing maximum possible parallelism at the first level. Within each slice, consecutive beams are incrementally transformed using coherency in the transformation computation. Also, coherency across slices can be exploited to further enhance performance. This coherency yields the second level of parallelism through the use of the vector processing or pipelining. Other ongoing efforts include investigations into image reconstruction techniques, load balancing strategies, and improving performance. Author (revised)

N93-32323*# Institute for Computer Applications in Science and Engineering, Hampton, VA.
HIGH PERFORMANCE FORTRAN WITHOUT TEMPLATES: AN ALTERNATIVE MODEL FOR DISTRIBUTION AND ALIGNMENT Final Report
Barbara Chapman (Wien Univ., Austria.), Piyush Mehrotra, and Hans Zima (Wien Univ., Austria.) Washington Apr. 1993 23 p Submitted for publication
(Contract NAS1-19480)
(NASA-CR-191451; NAS 1.26:191451; ICASE-93-17) Avail: CASI HC A03/MF A01

Language extensions of FORTRAN are being developed which permit the user to map data structures to the individual processors of distributed memory machines. These languages allow a programming style in which global data references are used. Current efforts are focussed on designing a common basis for such languages, the result of which is known as High Performance Fortran (HPF). One of the central debates in the HPF effort revolves around the concept of templates, introduced as an abstract index space to which data could be aligned. A model for the mapping of data which provides the functionality of High Performance Fortran distributions without the use of templates is presented. Author (revised)

N93-32346 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.
ANT SYSTEM FOR JOB-SHOP SCHEDULING
Alberto Colorni, Marco Dorigo (International Computer Science Inst., Berkeley, CA.), Vittorio Maniezzo, and Marco Trubian Oct. 1992 17 p
(Rept-92-066; ETN-93-93996) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

An heuristics applying the Ant system is presented. This is a stochastic optimization algorithm that takes inspiration from the model of natural processes and has its highlight in the distribution of search over several interacting agents called ants. The effectiveness of the algorithm is due to the cooperation among ants, by the change of a global problem specific memory structure, the trail graph. It is shown how the Ant algorithm can be applied to find good solutions of job-shop scheduling problems, thus providing a paradigm according to which a hard search task can be

distributed over many interacting agents. Computational results and how the proposed algorithm can benefit from parallel hardware are discussed. ESA

N93-32359*# Institute for Computer Applications in Science and Engineering, Hampton, VA.
MAPPING ROBUST PARALLEL MULTIGRID ALGORITHMS TO SCALABLE MEMORY ARCHITECTURES Final Report
Andrea Overman and John VanRosendale Washington Jun. 1993 15 p Submitted for publication
(Contracts NAS1-19480; NAS1-18605; RTOP 505-90-52-01)
(NASA-CR-191470; NAS 1.26:191470; ICASE-93-24) Avail: CASI HC A03/MF A01

The convergence rate of standard multigrid algorithms degenerates on problems with stretched grids or anisotropic operators. The usual cure for this is the use of line or plane relaxation. However, multigrid algorithms based on line and plane relaxation have limited and awkward parallelism and are quite difficult to map effectively to highly parallel architectures. Newer multigrid algorithms that overcome anisotropy through the use of multiple coarse grids rather than line relaxation are better suited to massively parallel architectures because they require only simple point-relaxation smoothers. The parallel implementation of a V-cycle multiple semi-coarsened grid (MSG) algorithm or distributed-memory architectures such as the Intel iPSC/860 and Paragon computers is addressed. The MSG algorithms provide two levels of parallelism: parallelism within the relaxation or interpolation on each grid and across the grids on each multigrid level. Both levels of parallelism must be exploited to map these algorithms effectively to parallel architectures. A mapping of an MSG algorithm to distributed-memory architectures that demonstrate how both levels of parallelism can be exploited is described. The results is a robust and effective multigrid algorithm for distributed-memory machines. Author (revised)

N93-32361*# Michigan Technological Univ., Houghton. Dept. of Computer Science.
GLOBAL SYNCHRONIZATION ALGORITHMS FOR THE INTEL iPSC/860
Steven R. Seidel and Mark A. Davis 11 Aug. 1992 23 p
(Grant NAG2-757)
(NASA-CR-193618; NAS 1.26:193618; RNR-92-027) Avail: CASI HC A03/MF A01

In a distributed memory multicomputer that has no global clock, global processor synchronization can only be achieved through software. Global synchronization algorithms are used in tridiagonal systems solvers, CFD codes, sequence comparison algorithms, and sorting algorithms. They are also useful for event simulation, debugging, and for solving mutual exclusion problems. For the Intel iPSC/860 in particular, global synchronization can be used to ensure the most effective use of the communication network for operations such as the shift, where each processor in a one-dimensional array or ring concurrently sends a message to its right (or left) neighbor. Three global synchronization algorithms are considered for the iPSC/860: the gysnc() primitive provided by Intel, the PICL primitive sync0(), and a new recursive doubling synchronization (RDS) algorithm. The performance of these algorithms is compared to the performance predicted by communication models of both the long and forced message protocols. Measurements of the cost of shift operations preceded by global synchronization show that the RDS algorithm always synchronizes the nodes more precisely and costs only slightly more than the other two algorithms. Author (revised)

N93-32391 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.
INTRODUCTION TO NATURAL ALGORITHMS [INTRODUZIONE AGLI ALGORITMI NATURALI]
Alberto Colorni, Marco Dorigo (California Univ., Berkeley.), and Vittorio Maniezzo Sep. 1992 24 p In ITALIAN
(Rept-92-058; ETN-93-93990) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

The use of algorithms inspired by observation of natural phenomena in defining computational paradigms for solving complex problems is addressed. In particular, neural nets must be considered among these algorithms. Other natural algorithms, such as genetic algorithms, the evolution method, and the immune network, are presented. ESA

N93-32418# Rome Lab., Griffiss AFB, NY.
INITIAL DEFINITION OF A KNOWLEDGE-BASED SOFTWARE QUALITY ASSISTANT
Joseph A. Carozzoni Feb. 1993 104 p
(AF Proj. 5581)
(AD-A265866; RL-TR-93-28) Avail: CASI HC A06/MF A02

Prior and current research in the area of software quality reveals the necessity for a more innovative approach. This project suggests the need for further exploratory work in the application of knowledge-based and expert system technology to areas related to software quality. Prior investigation have focused on the development of an expert system to support the specification and generation of software quality factor goals. This project contemplates the creation and development of a comprehensive Knowledge-Based Software Quality Assistant (KBQA), which would eventually encompass the entire software development life cycle. DTIC

N93-32419# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
THE REUSE OF LARGE-SCALE COMPONENTS
Haikuan Li 1992 45 p
(Rept-92-95; ETN-93-94284) Copyright Avail: CASI HC A03/MF A01

A large scale component is a software component originated from software analysis, design, and implementation. The principle for the specification of large scale components is introduced and the application of such a principle for the representation of large scale components is described. A method for the consistency verification of large scale components is addressed. This method suggests that the verification can be, with a few rules, simplified by inference from extended data flow graphs. ESA

N93-31265# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany).
ACCURACY ESTIMATION FOR DIGITIZING [ZUR GENAUIGKEITSUNTERSUCHUNG VON DIGITIZERN]
Robert Kauper *In its* Reports on Cartography and Topography, Series 1, Report No. 103 1989 p 79-90 In GERMAN (For primary document see N93-31256 12-43)
Avail: CASI HC A03/MF A02

N93-31567*# Southwest Research Inst., San Antonio, TX.
COMMERCIALIZATION OF NESSUS: STATUS
Ben H. Thacker and Harry R. Millwater *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 105-110 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

N93-31569*# Southwest Research Inst., San Antonio, TX.
PROBABILISTIC STRUCTURAL ANALYSIS ALGORITHM DEVELOPMENT FOR COMPUTATIONAL EFFICIENCY
Y.-T. Wu *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 121-130 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

N93-32098*# Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Electrical and Computer Engineering.
AN ICONIC PROGRAMMING LANGUAGE FOR SENSOR-BASED ROBOTS
Matthew Gertz, David B. Stewart, and Pradeep K. Khosla *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 1-8 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32119*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GRAPHICS SIMULATION AND TRAINING AIDS FOR ADVANCED TELEOPERATION
Won S. Kim, Paul S. Schenker, and Antal K. Bejczy *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 182-189 (For

primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32127*# Air Force Systems Command, Griffiss AFB, NY. Rome Lab.
KNOWLEDGE-BASED SIMULATION USING OBJECT-ORIENTED PROGRAMMING
Karen M. Sidoran *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 233-237 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

N93-32136*# Stanford Univ., CA. Robotics Lab.
AGENT ORIENTED PROGRAMMING: AN OVERVIEW OF THE FRAMEWORK AND SUMMARY OF RECENT RESEARCH
Yoav Shoham *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 296-304 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32140*# Oregon State Univ., Corvallis.
MIXED DATA/GOAL DRIVEN INTELLIGENT REAL-TIME ASSESSMENT AND CONTROL Abstract only
Bruce DAmbrosio *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 320 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

N93-32141*# General Electric Co., Moorestown, NJ.
INTEGRATION OF DOMAIN AND RESOURCE-BASED REASONING FOR REAL-TIME CONTROL IN DYNAMIC ENVIRONMENTS
Keith Morgan, Kenneth R. Whitebread, Michael Kendus, and Andrew S. Cromarty (Distributed Systems Technology, Palo Alto, CA.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 321-326 Sponsored by DARPA (For primary document see N93-32097 12-99)
(Contract MDA972-90-C-0005; ARPA Order 6661/50)
Avail: CASI HC A02/MF A04

N93-32142*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
AN ON-LINE EXPERT SYSTEM FOR DIAGNOSING ENVIRONMENTALLY INDUCED SPACECRAFT ANOMALIES USING CLIPS
Michael Lauriente, Mark Rolincik (University Research Foundation, Greenbelt, MD.), Harry C Koons (Aerospace Corp., Los Angeles, CA.), and David Gorney (Aerospace Corp., Los Angeles, CA.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 329-339 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

N93-32146*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
DESSY: MAKING A REAL-TIME EXPERT SYSTEM ROBUST AND USEFUL
Sherry A. Land, Jane T. Malin, and Donald R. Culp (Rockwell International Corp., Houston, TX.) *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 364-37 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32147*# Illinois Univ., Urbana. Dept. of Computer Science.
PERTS: A PROTOTYPING ENVIRONMENT FOR REAL-TIME SYSTEMS
Jane W. S. Liu, Kwei-Jay Lin, and C. L. Liu *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 372-379 Sponsored in part by ONR (For primary document see N93-32097 12-99)
(Contracts N00014-89-J-1181; N00014-92-J-1815)
Avail: CASI HC A02/MF A04

N93-32154*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SOFTWARE ENGINEERING
Ernest M. Fridge, III, Jim Hiott (Paramax Systems Corp., Houston, TX.), Jim Golej (Mitre Corp., Houston, TX.), and Allan Plumb (Barrios Technology, Inc., Houston, TX.) *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 427-43 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32156*# Air Force Systems Command, Griffiss AFB, NY. Rome Lab.
THE KNOWLEDGE-BASED SOFTWARE ASSISTANT: BEYOND CASE
Joseph A. Carozzoni *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 445-452 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32157*# Air Force Systems Command, Griffiss AFB, NY. Rome Lab.
ARIES: ACQUISITION OF REQUIREMENTS AND INCREMENTAL EVOLUTION OF SPECIFICATIONS
Nancy A. Roberts *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 453-456 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

N93-32158*# Air Force Systems Command, Griffiss AFB, NY. Rome Lab.
THE ENHANCED SOFTWARE LIFE CYLE SUPPORT ENVIRONMENT (ProSLCSE): AUTOMATION FOR ENTERPRISE AND PROCESS MODELING
James R. Milligan and James E. Dutton (International Software Systems, Inc., Austin, TX.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 457-464 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

62 COMPUTER SYSTEMS

Includes computer networks and special application computer systems.

N93-31473# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
EVALUATING MASTER-SLAVE IMPLEMENTATION OF DOUBLE-DOT PARSING FOR MASSIVE PARALLEL MIMD SYSTEMS
J. G. E. Olk and J. P. M. deVreught 1992 64 p
(Rept-92-78; ETN-93-94271) Copyright Avail: CASI HC A04/MF A01
The performance of the master-slave implementation on a MIMD system of a parallel recognizer, which uses the double dot algorithm, is evaluated. An overview of general parallel programming techniques for distributed memory MIMD systems is given. The double dot parsing algorithm is explained. The master-slave implementation is discussed and analyzed. Results of the analysis are used and improvements for the implementation, covering both the software and the hardware, are proposed. Conclusions on the performance of the double dot parsing algorithm are given. ESA

N93-31493# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
PRACTICAL RESULTS ON PARALLEL PARSING
J. P. M. deVreught 1992 47 p
(Rept-92-79; ETN-93-94272) Copyright Avail: CASI HC A03/MF A01
The practical results of three parallel parsers, the CYK, Earley's, and

the double dotted algorithms are described. Measurements of the sequential time, the parallel time, and the space are discussed. Although conclusions can not be drawn, some observations are made. ESA

N93-31504# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
GENERALIZED STEADY-STATE, APPLIED TO 2-D, 3-D MASSIVELY PARALLEL COMPUTING
L. Dekker 1992 24 p
(Rept-92-71; ETN-93-94263) Copyright Avail: CASI HC A03/MF A01

A semi-analytic method for simulation of distributed parameter systems through massively parallel computing is described. The method is based upon a concept 'generalized steady state'. For linear time independent lumped parameter systems for this concept an 'improper time integral' and a 'series expansion' are considered as well as a formulation, based upon minimization of the system energy from the very past to the very future and applicable also to nonlinear systems. The 'generalized steady state' is extensively elucidated for linear time independent distributed parameter systems in the knowledge that the 'generalized steady state' is often the main part of the state of large systems. The discussion about distributed parameter systems is restricted to an 'infinite series' formation. For two and three dimensional diffusion systems, defined within a rectangular region, it is explained that this infinite series consists of time derivatives of 4 and 8 'corner' input signals, respectively. ESA

N93-31522# Technische Univ., Eindhoven (Netherlands).
PERIODIC MULTIPROCESSOR SCHEDULING Ph.D. Thesis
Johannes Henricus Ma Korst 1992 171 p
(ETN-93-94043) Avail: CASI HC A08/MF A02

A study on periodic multiprocessor scheduling, initially inspired from the problem of cost effectively implementing real time video signal processing in hardware, is presented. Periodic scheduling is concerned with the planning of periodic activities, that is, activities that have to be identically repeated at regular intervals. Such periodic activities include the processing of samples of a digital signal, the arrival of trains at a railway station, the oiling of machinery, and the workshifts of personnel. Combinatorial optimization, including optimization and approximation algorithms, and periodic assignment are described. ESA

N93-31616# Universiteit Twente, Enschede (Netherlands). Dept. of Computer Science.
A BLUEPRINT FOR A PARALLEL PARSER GENERATOR
Henk Alblas Oct. 1992 24 p
(MEMO-INF-92-65; ETN-93-94107) Copyright Avail: CASI HC A03/MF A01

The parallelization of the attributed ELL(1)-parser generator of the Twente Compiler-Generator System is investigated. The proposed parallel parser generator operates by splitting the input specification into separately executable streams. A stream corresponds to a single attributed production or a set of attributed productions. Each stream is processed, concurrently with other streams, through the conventional generator phases, namely testing whether the grammar satisfies the ELL(1)-conditions, verifying the reachability and availability of the attributes, and finally, generating the attributed parser and attribute evaluator routines. Within the processing of a stream, parallelism is exploited by partitioning the stream into a number of tasks, which correspond to parts of the conventional generator phases. ESA

N93-31640*# Cornell Univ., Ithaca, NY. School of Mechanical and Aerospace Engineering.
REAL-TIME TRAJECTORY OPTIMIZATION ON PARALLEL PROCESSORS Final Report
Mark L. Psiaki 10 Jul. 1993 209 p
(Grant NAG1-1009)
(NASA-CR-193303; NAS 1.26:193303) Avail: CASI HC A10/MF A03

A parallel algorithm has been developed for rapidly solving trajectory optimization problems. The goal of the work has been to develop an algorithm that is suitable to do real-time, on-line optimal guidance through repeated solution of a trajectory optimization problem. The algorithm has been developed on an INTEL iPSC/860 message passing parallel processor. It uses a zero-order-hold discretization of a continuous-time problem and solves the resulting nonlinear programming problem using a custom-designed augmented Lagrangian nonlinear programming algorithm. The algorithm achieves parallelism of function, derivative, and search direction calculations through the principle of domain decomposition applied along the time axis. It has been encoded and tested on 3 example problems, the Goddard problem, the acceleration-limited, planar minimum-time to the origin problem, and a National Aerospace Plane minimum-fuel ascent guidance problem. Execution times as fast as 118 sec of wall clock time have been achieved for a 128-stage Goddard problem solved on 32 processors. A 32-stage minimum-time problem has been solved in 151 sec on 32 processors. A 32-stage National Aerospace Plane problem required 2 hours when solved on 32 processors. A speed-up factor of 7.2 has been achieved by using 32-nodes instead of 1-node to solve a 64-stage Goddard problem.
Derived from text

N93-31642*# Research Triangle Inst., Research Triangle Park, NC.
ADVANCED LAUNCH SYSTEM MULTI-PATH REDUNDANT AVIONICS ARCHITECTURE ANALYSIS AND CHARACTERIZATION Final Report
Robert L. Baker Washington Jun. 1993 200 p
(Contract NAS1-17964; RTOP 506-46-21-56)
(NASA-CR-4516; NAS 1.26:4516) Avail: CASI HC A09/MF A03

The objective of the Multi-Path Redundant Avionics Suite (MPRAS) program is the development of a set of avionic architectural modules which will be applicable to the family of launch vehicles required to support the Advanced Launch System (ALS). To enable ALS cost/performance requirements to be met, the MPRAS must support autonomy, maintenance, and testability capabilities which exceed those present in conventional launch vehicles. The multi-path redundant or fault tolerance characteristics of the MPRAS are necessary to offset a reduction in avionics reliability due to the increased complexity needed to support these new cost reduction and performance capabilities and to meet avionics reliability requirements which will provide cost-effective reductions in overall ALS recurring costs. A complex, real-time distributed computing system is needed to meet the ALS avionics system requirements. General Dynamics, Boeing Aerospace, and C.S. Draper Laboratory have proposed system architectures as candidates for the ALS MPRAS. The purpose of this document is to report the results of independent performance and reliability characterization and assessment analyses of each proposed candidate architecture and qualitative assessments of testability, maintainability, and fault tolerance mechanisms. These independent analyses were conducted as part of the MPRAS Part 2 program and were carried under NASA Langley Research Contract NAS1-17964, Task Assignment 28. Author (revised)

N93-31864# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
DECAY-USAGE SCHEDULING IN MULTIPROCESSOR AND DISTRIBUTED SYSTEMS. 1: THEORY
D. H. J. Epema 1992 25 p Sponsored by IBM, Yorktown Heights, NY, and IBM, Netherlands
(Rept-92-105; ETN-93-94294) Copyright Avail: CASI HC A03/MF A01

Priority aging or decay usage scheduling is a widely used time sharing scheduling policy which can deal with a workload of both interactive and batch jobs by degrading the priority of a job when it acquires CPU (Central Processing Unit) time, and by increasing its priority when it does not use the CPU. A decay usage scheduling policy in multiprocessor systems modeled after popular real systems is addressed. The priority of a job consists of a base priority and a time dependent part based on processor usage. Because the priorities in the model are time dependent, a stochastic analysis, for instance for (mean, service time dependent) response times seems impossible. However, a deterministic analysis is feasible. It is shown how for a fixed set of jobs with a very large (infinite) processing demand, the steady state service fractions can be obtained given the base priorities, and conversely, how to set the base priorities given required service fractions. The tradeoffs between multiprocessors, partitioned multiprocessors, and distributed systems are considered. ESA

N93-31985# Lawrence Livermore National Lab., CA.
NEW ARCHITECTURES TO REDUCE I/O BOTTLENECKS IN HIGH-PERFORMANCE SYSTEMS
S. S. Coleman and R. W. Watson Jan. 1993 9 p Presented at the 26th Hawaiian International Conference on System Science, Kauai, HI, 5-8 Jan. 1993

(Contract W-7405-eng-48)
(DE93-009059; UCRL-JC-111834; CONF-930117-7) Avail: CASI HC A02/MF A01

Large commercial and scientific applications are straining input/output and storage facilities, a condition compounded by new networking and distributed-system technology, and by supercomputer, massively-parallel, and high-performance workstation architectures. This paper reviews large-scale application I/O requirements that are driving the need for high-performance, distributed, hierarchical storage, and then discusses the emerging shift to network-connected devices and third-party protocol architectures to meet these requirements. It illustrates the discussion with actual implementations and with standards work under way in the IEEE Storage System Standards Working Group. DOE

N93-31986# Lawrence Livermore National Lab., CA.
EXPERIENCES WITH DIFFERENT PARALLEL PROGRAMMING PARADIGMS FOR MONTE CARLO PARTICLE TRANSPORT LEADS TO A PORTABLE TOOLKIT FOR PARALLEL MONTE CARLO
W. R. Martin (Michigan Univ., Ann Arbor.), A. Majumdar (Michigan Univ., Ann Arbor.), J. A. Rathkopf, and M. Litvin (Phillips Academy, Andover, MA.) Apr. 1993 15 p Presented at the International Topical Meeting on Mathematical Methods and Supercomputing in Nuclear Applications, Karlsruhe (Germany), 19-23 Apr. 1993
(Contracts W-7405-eng-48; DE-FG02-92ER-75709)
(DE93-009061; UCRL-JC-111846; CONF-930404-12) Avail: CASI HC A03/MF A01

Monte Carlo particle transport is easy to implement on massively parallel computers relative to other methods of transport simulation. This paper describes experiences of implementing a realistic demonstration Monte Carlo code on a variety of parallel architectures. Our 'pool of tasks' technique, which allows reproducibility from run to run regardless of the number of processors, is discussed. We present detailed timing studies of simulations performed on the 128 processor BBN-ACI TC2000 and preliminary timing results for the 32 processor Kendall Square Research KSR-1. Given sufficient workload to distribute across many computational nodes, the BBN achieves nearly linear speedup for a large number of nodes. The KSR, with which we have had less experience, performs poorly with more than ten processors. A simple model incorporating known causes of overhead accurately predicts observed behavior. A general-purpose communication and control package to facilitate the implementation of existing Monte Carlo packages is described together with timings on the BBN. This package adds insignificantly to the computational costs of parallel simulations. DOE

N93-32080# Rochester Univ., NY. Dept. of Computer Science.
BEYOND DATA PARALLELISM: THE ADVANTAGES OF MULTIPLE PARALLELIZATIONS IN COMBINATORIAL SEARCH
Lawrence A. Crowl, Mark E. Crovella, Thomas J. LeBlanc, and Michael L. Scott Apr. 1993 22 p
(Contract N00014-92-J-1801; NSF CDS-88-227240; ARPA Order 8930)
(AD-A265008; TR-451) Avail: CASI HC A03/MF A01

Two popular myths concerning parallel programming are: (1) there is a best parallelization for a given application on a given class of machine; and (2) loop-based data parallelism captures all useful parallelizations. We challenge these myths by considering alternative parallelizations of combinatorial search, examining the factors that determine the best-performing option for this important class of problems. Using subgraph isomorphism as a representative search problem, we show how the density of solution space, the number of solutions desired, the number of available processors, and underlying architecture affect the choice of an efficient parallelization. We conclude that there is no one best parallelization that suffices over a range of machines, inputs, and precise problem specifications. As a corollary, we argue that programming environments should not focus exclusively on data parallelism, since parallel tree search or hybrid forms of parallelism may perform better for some applications. DTIC

N93-32213*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
PERFORMANCE ANALYSIS OF A LARGE-GRAIN DATAFLOW SCHEDULING PARADIGM
Steven D. Young and Robert W. Wills Washington Jun. 1993 17 p
(RTOP 509-10-04)
(NASA-TP-3323; L-17128; NAS 1.60:3323) Avail: CASI HC A03/MF A01

A paradigm for scheduling computations on a network of multiprocessors using large-grain data flow scheduling at run time is described and analyzed. The computations to be scheduled must follow a static flow graph, while the schedule itself will be dynamic (i.e., determined at run time). Many applications characterized by static flow exist, and they include real-time control and digital signal processing. With the advent of computer-aided software engineering (CASE) tools for capturing software designs in dataflow-like structures, macro-dataflow scheduling becomes increasingly attractive, if not necessary. For parallel implementations, using the macro-dataflow method allows the scheduling to be insulated from the application designer and enables the maximum utilization of available resources. Further, by allowing multitasking, processor utilizations can approach 100 percent while they maintain maximum speedup. Extensive simulation studies are performed on 4-, 8-, and 16-processor architectures that reflect the effects of communication delays, scheduling delays, algorithm class, and multitasking on performance and speedup gains.
Author (revised)

N93-32224*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
A PC-BASED SIMULATION OF THE NATIONAL TRANSONIC FACITITY'S SAFETY MICROPROCESSOR
J. J. Thibodeaux, W. A. Kilgore (Vigyan Research Associates, Inc., Hampton, VA.), and S. Balakrishna (Vigyan Research Associates, Inc., Hampton, VA.) Jul. 1993 76 p
(RTOP 505-59-85-01)
(NASA-TM-109003; NAS 1.15:109003) Avail: CASI HC A05/MF A01

A brief study was undertaken to demonstrate the feasibility of using a state-of-the-art off-the-shelf high speed personal computer for simulating a microprocessor presently used for wind tunnel safety purposes at Langley Research Center's National Transonic Facility (NTF). Currently, there is no active display of tunnel alarm/alert safety information provided to the tunnel operators, but rather such information is periodically recorded on a process monitoring computer printout. This does not provide on-line situational information nor permit rapid identification of safety operational violations which are able to halt tunnel operations. It was therefore decided to simulate the existing algorithms and briefly evaluate a real-time display which could provide both position and trouble shooting information.
Author

N93-32355*# Illinois Univ., Urbana-Champaign. Center for Reliable and High-Performance Computing.
APPLICATION OF COMPILER-ASSISTED MULTIPLE INSTRUCTION ROLLBACK RECOVERY TO SPECULATIVE EXECUTION
N. J. Alewine, W. K. Fuchs, and W.-M. Hwu 12 Jul. 1993 18 p
(Grant NAG1-613)
(NASA-CR-193360; NAS 1.26:193360; UILU-ENG-93-2229; CRHC-93-16)
Avail: CASI HC A03/MF A01

Speculative execution is a method to increase instruction level parallelism which can be exploited by both super-scalar and VLIW architectures. The key to a successful general speculation strategy is a repair mechanism to handle mispredicted branches and accurate reporting of exceptions for speculated instructions. Multiple instruction rollback is a technique developed for recovery from transient processor failure. Many of the difficulties encountered during recovery from branch misprediction or from instruction re-execution due to exception in a speculative execution architecture are similar to those encountered during multiple instruction rollback. The applicability of a recently developed compiler-assisted multiple instruction rollback scheme to aid in speculative execution repair is investigated. Extensions to the compiler-assisted scheme to support branch and exception repair are presented along with performance measurements across ten application programs.
Author

N93-32395# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
EXPLICIT, HIGH-ORDER RUNGE-KUTTA-NYSTROEM METHODS FOR PARALLEL COMPUTERS
B. P. Sommeijer Oct. 1992 20 p
(CWI-NM-R9219; ETN-93-94147) Copyright Avail: CASI HC A03/MF A01

The construction of explicit Runge-Kutta-Nystroem (RKN) methods of arbitrarily high order is presented. The order is borrowed from an underlying implicit RKN method. For the approximate solution of this method, an iteration scheme is defined. Prescribing a fixed number of iterations, the resulting scheme is an explicit RKN method. The iteration scheme is defined in such a way that many of the right hand side evaluations can be done concurrently. As a result, explicit RKN schemes of order p are obtained which require, on a parallel computer, approximately p/2 right hand side evaluations per step. Both in fixed and variable step mode, the schemes are compared with existing high order RKN methods from the literature and demonstrate superior behavior. ESA

N93-32396# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
PARALLEL BLOCK PREDICTOR-CORRECTOR METHODS OF RUNGE-KUTTA TYPE
P. J. vanderHouwen and Huu Cong Nguyen Oct. 1992 13 p Sponsored by Amsterdam Univ., Netherlands
(CWI-NM-R9220; ETN-93-94148) Copyright Avail: CASI HC A03/MF A01

Block predictor corrector methods using Runge-Kutta correctors are constructed. The approach consists of applying the predictor corrector method not only at step points, but also at off step points, so that, in each step, a whole block of approximations to the exact solution is computed. In the next step, these approximations are used for obtaining a high order predictor formula by Lagrange or Hermite interpolation. By choosing the abscissas of the off step points to be narrowly spaced, a much more accurately predicted value is obtained than by predictor formulas based on preceding step point values. The sequential costs of these block predictor corrector methods are comparable with those of a conventional predictor corrector method. By using Runge-Kutta correctors, the predictor corrector iteration scheme itself is also highly parallel. Application of these block predictor corrector methods based on Lagrange-Gauss pairs to test problems reveals that the sequential costs are reduced by a factor ranging from 2-11 when compared with the best sequential methods. ESA

N93-32135*# Maryland Univ., College Park. Dept. of Computer Science.
MASSIVELY PARALLEL SUPPORT FOR A CASE-BASED PLANNING SYSTEM
Brian P. Kettler, James A. Hendler, and William A. Anderson *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 288-295 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

63 CYBERNETICS

Includes feedback and control theory, artificial intelligence, robotics and expert systems.

For related information see also *54 Man/System Technology and Life Support.*

N93-31071 Michigan Univ., Ann Arbor.
ESTIMATION AND CONTROL IN DISCRETE-TIME NONLINEAR SYSTEMS Ph.D. Thesis
Yongkyu Song 1992 146 p
Avail: Univ. Microfilms Order No. DA9308452

A set of problems arising in the application of adaptive control to discrete-time nonlinear systems is addressed. First, the class of discrete-time nonlinear systems to which a linear parameter estimation scheme and certainty equivalence control can be applied is extended. That is, it is shown that direct model reference adaptive control (MRAC) via output-feedback is possible for SISO, minimum phase, linear discrete-time systems followed by a nonlinear element, with further nonlinearities acting on the output. A few assumptions that are needed in the case of continuous-time systems of the same form are relaxed. Simulations are performed with two examples: a first order system with Coulomb friction and a simple manipulator. A heuristic indirect MRAC scheme with the extended Kalman filter (EKF) as a parameter estimator is also simulated on the simple manipulator. Motivated by the simulation studies with the EKF, then attention is on the EKF as a parameter estimator. Since the EKF is actually used as an approximate state estimator in this context, a detailed analysis of the EKF when it is used as an observer for discrete-time nonlinear systems is made. Based on our new proof of the fact that the Kalman filter is a global observer for linear (discrete time) time-varying systems, it is shown that the EKF is indeed a local asymptotic observer for general discrete-time nonlinear systems. Finally, one of the most common assumptions in adaptive control or tracking: a well-defined relative degree, is addressed. It is shown that this is indeed a necessary condition for asymptotic tracking in discrete-time nonlinear systems. To show this, tracking problems are defined, and a local linear input-output behavior of a discrete-time system is introduced in relation to a well-defined relative degree. It is then shown that if a plant is invertible and accessible from the origin and a compensator solves the local asymptotic tracking problem while keeping the closed loop system invertible, then the plant necessarily has a well-defined relative degree at the origin. This result confirms that a well-defined relative degree is one of the basic requirements for model reference type control, which includes most adaptive control.
Dissert. Abstr.

N93-31254 Politecnico di Milano (Italy). Dept. of Electronics.
TESTABILITY OF ARTIFICIAL NEURAL NETWORKS: A BEHAVIORAL APPROACH
Vincenzo Piuri, Mariagiovanna Sami, and Donatella Sciuto 1992 33 p
(Rept-92-047; ETN-93-93986) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

Design of neural application specific integrated circuit introduces the problem of analyzing circuit testability and, possibly, of adapting design alternatives that grant good testability. The trend of associating testability analysis with the first, behavioral level design phase has not been extended, up to now, to neural chip design. An approach to behavioral level testability analysis for dedicated feed forward multilayer nets is presented. The behavioral error model introduced allows good mapping of the physical faults in widely different implementations. Conditions for error controllability, observability, and global testability are analytically derived. The purpose is to verify whether it is possible to restore all modeled errors and to propagate the error's effects to the primary outputs. Mapping of physical faults into behavioral errors is performed for some representative architectures. ESA

N93-31255 Politecnico di Milano (Italy). Dept. of Electronics.
ANALYSIS OF FAULT TOLERANCE IN ARTIFICIAL NEURAL NETWORKS
Vincenzo Piuri, Mariagiovanna Sami, and Renato Stefanelli 1992 27 p
(Rept-92-048; ETN-93-93987) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

The intrinsic capacity for fault tolerance that characterizes the neural models is investigated. Particular attention is given to multilayered feedforward nets. The main scope is to identify the influence of errors onto the neural computation, so as to obtain a set of guidelines useful for the design of specific implementations. A high abstraction level (corresponding to the neural graphs) is taken as the basis of the study, and a corresponding error model is introduced. The effects of such errors are analytically derived, and the conditions that allow complete recovery through redistribution of weights in the error free components of the network are derived. Mappingthe criteria of physical faults onto the abstract errors thus examined allow the evaluation of the actual robustness of possible neural network implementations and identify the critical areas where architectural redundance should be introduced. This technique is presented for a few sample circuits corresponding to some main implementation approaches. ESA

N93-31332# National Inst. of Standards and Technology, Gaithersburg, MD. Advanced Systems Div.
OPTIMIZATION OF ADAPTIVE RESONANCE THEORY NETWORK WITH BOLTZMANN MACHINE
O. M. Omidvar and C. L. Wilson Apr. 1993 15 p Prepared in cooperation with District of Columbia Univ., Washington, Dept. of Computer Science
(PB93-188134; NISTIR-5176) Avail: CASI HC A03/MF A01

Optimization of large neural networks is essential in improving the network speed and generalization power, while at the same time reducing the training error and the network complexity. Boltzmann methods have been used as a statistical method for combinatorial optimization and for the

design of learning algorithms. In the networks studied, the Adaptive Resonance Theory (ART) serves as a connection creation operator and the Boltzmann method serves as a competitive connection annihilation operator. By combining these two methods it is possible to generate small networks that have similar testing and training accuracy and good generalization from small training sets. The findings demonstrate that for a character recognition problem the number of weights in a fully connected network can be reduced by over 80%. The authors have applied the Boltzmann criteria to differential pruning of the connections which is based on the weight contents rather than on the number of connections. NTIS

N93-31427# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

TOWARDS A NEW APPROACH TO AUTONOMOUS NAVIGATION FOR A VEHICLE: A LINK BETWEEN PROBABILITY DATA ASSOCIATION FILTERING AND THE EVIDENCE THEORY Ph.D. Thesis - Paris Univ., Orsay [VERS UN NOUVEAU CONCEPT DE NAVIGATION AUTONOME D'ENGIN. UN LIEN ENTRE LE FILTRAGE A ASSOCIATION PROBABILISTE DE DONNEES ET LA THEORIE DE L'EVIDENCE]

Jean Dezert Oct. 1990 472 p In FRENCH

(ONERA-NT-1990-11; ETN-93-93729) Avail: CASI HC A20/MF A04

The theory and application of a method for autonomous navigation of a vehicle (missile flying at low altitude) which is an interesting alternative to the traditional method using image correlation techniques is presented. These last methods are very expensive for operational implementation. The approach uses only the knowledge of the navigation map stored aboard the vehicle and the relative position information between the vehicle and the landmarks detected by the sensors aboard the vehicle during the mission. The navigation map is defined by the geographical coordinates register of landmarks which might be flown over. The probabilistic data association technique appears as the best method in order to remove the association ambiguities of the encountered landmarks and those stored in the navigation map. The modification of the probabilistic data association filter for this application category leads to a robust autonomous navigation filter which has a very simple real time structure. The navigation filter performance improves with the identification accuracy of the landmarks. In a first step, the recognition information present in the navigation map and delivered by the sensors is modeled as Bayesian. A new real time navigation filter structure with a low computational load is then presented. In a second step, a filter structure able to consider both an uncertain navigation map and an uncertain recognition information is finally proposed, to answer practical requirements appearing in image processing. The theory of evidence and the Dempster inference rule allows the localization and identification ambiguity problem to be solved without altering the probabilistic data association method. ESA

N93-31468# Universiteit Twente, Enschede (Netherlands). Faculty of Applied Mathematics.

OPTIMAL SOLUTIONS TO A TWO-BLOCK H INFINITY PROBLEM

Gjerrit Meinsma Sep. 1992 31 p

(MEMO-1080; ETN-93-94120) Avail: CASI HC A03/MF A01

A two block H(infinity) problem is solved. The suboptimal and optimal solutions to the two block problem are derived in the frequency domain, using canonical and noncanonical factorizations, respectively. A bound on the McMillan degree of optimal solutions is derived. A polynomial algorithm for computation of noncanonical factors is developed which may be used to generate all optimal or suboptimal solutions to the two block problem. ESA

N93-31469# Amsterdam Univ. (Netherlands). Dept. of Computational Linguistics.

NEURAL NETS AND THEIR RELEVANCE FOR INFORMATION RETRIEVAL

J. C. Scholtes Oct. 1991 67 p Sponsored by MSC Beheer B.V., Amsterdam, Netherlands

(CL-91-02; ETN-93-94132) Avail: CASI HC A04/MF A01

Two types of implemented neural methods for free-text data base search are presented. In the first method, a specific interest (or 'query') is taught to a Kohonen feature map. By using this network as a neural filter on a dynamic free-text data base, only associated subjects are selected from this data base. The second method can be used in a more static environment. Statistical properties (n-gram or keyword distributions) from various texts are taught to a feature map. A comparison of a query with this feature map results in the selection of texts closely related to each other with respect to their contents. All methods are compared with classical statistical information retrieval algorithms. Various simulations show that the neural net indeed converges towards a proper representation of the query as well as the objects in the data base. The first algorithm seems much better scalable (linear versus exponential complexity) than its statistical counterparts, resulting in higher speeds, less memory needs, and easier maintainability. The second one particularly shows an elegant and uniform generalization and association method, increasing the selection quality. By combining research results from connectionist Natural Language Processing (NLP) and Information Retrieval (IR), a better understanding of neural nets in NLP, a clearer view of the relation between neural nets and statistical pattern recognition, and an increased IR quality are obtained. ESA

N93-31483# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

THE LINEAR QUADRATIC DIGITAL CONTROL OF INFINITE-DIMENSIONAL SYSTEMS WITH UNBOUNDED INPUT AND OUTPUT OPERATORS

Florian Dan Barb and Willem L. deKoning 1992 26 p

(Rept-92-49; ETN-93-94241) Copyright Avail: CASI HC A03/MF A01

The Linear Quadratic Control Problem (LQCP) for infinite dimensional systems with unbounded input and output operators as introduced by Pritchard and Salamon is studied by making use of discrete time output observation and piecewise constant controls, obtaining in this way a digital control system. A natural way of computing a stabilizing suboptimal compensator is proposed. Corresponding values of the equivalent discrete time cost function are estimated with respect to the sampling step and the loss of performance is evaluated. A comparison with the solution of the discrete time LQCP for the discretized system is also done. ESA

N93-31512# Groningen Rijksuniv. (Netherlands). Dept. of Mathematics.

NECESSARY AND SUFFICIENT CONDITIONS FOR J-SPECTRAL FACTORIZATIONS WITH A J-LOSSLESS PROPERTY FOR INFINITE-DIMENSIONAL SYSTEMS IN CONTINUOUS AND DISCRETE TIME

Ruth F. Curtain and Alejandro Rodriguez 10 Nov. 1992 25 p Sponsored by Univ. Nacional de Mexico, Mexico City

(W-9217; ETN-93-94100) Avail: CASI HC A03/MF A01

Necessary and sufficient conditions for J-spectral factorizations are given in terms of the existence of a self-adjoint, stabilizing solution of an appropriate Riccati equation in infinite dimensions. Furthermore, it is shown that a certain J-lossless property holds if and only if the stabilizing solution to the Riccati equation is nonnegative definite. These results are proved first for the continuous time case and analogous results are thereby derived for the discrete time case by means of a bilinear transformation of the complex plane. ESA

N93-31513# Groningen Rijksuniv. (Netherlands). Dept. of Mathematics.

ANALYTIC SYSTEM PROBLEMS AND J-LOSSLESS FACTORIZATION FOR INFINITE-DIMENSIONAL LINEAR SYSTEMS

Ruth F. Curtain and Michael Green 1992 46 p Revised

(W-9218; ETN-93-94101) Avail: CASI HC A03/MF A01

The coprime factorization approach to the synthesis of internally stabilizing controllers satisfying an H(infinity) norm bound is extended to a class of systems with irrational transfer matrices. Using the coprime factorization description the H(infinity) control problem can be reduced to two stable analytic system problems. Such problems have solutions if and only if a certain J-lossless factorization exists. The full H(infinity) synthesis problem is shown to be equivalent to the solution of two nested J-lossless factorizations. If the irrational transfer matrix has a state space realization, then the known state formulae for the H(infinity) control problem may be recovered using the relationship between J-lossless factorizations and solutions of Riccati equations. However, the results derived are valid for a larger class of infinite dimensional systems. ESA

N93-31525# Groningen Rijksuniv. (Netherlands). Dept. of Mathematics.

SAMPLED-DATA AND DISCRETE-TIME H2 OPTIMAL CONTROL

H. L. Trentelman and A. A. Stoorvogel (Technische Univ., Eindhoven, Netherlands.) 2 Dec. 1992 31 p

(W-9222; ETN-93-94105) Avail: CASI HC A03/MF A01

The sampled data H(sub 2) optimal control problem is addressed. Given a linear time invariant continuous time system, the problem of minimizing the H(sub 2) performance over all sampled data controllers with a fixed sampling period can be reduced to a pure discrete time H(sub 2) optimal control problem. This discrete time H(sub 2) problem is always singular. Motivated by this, a treatment of the discrete time H(sub 2) optimal control problem in its full generality is given. The results obtained are applied to the singular discrete time H(sub 2) problem arising from the sampled data H(sub 2) problem. In particular, conditions for the existence of optimal sampled data controllers are given. The H(sub 2) performance of a continuous time controller can always be recovered asymptotically by choosing the sampling period sufficiently small. The optimal sampled data H(sub 2) performance converges to the continuous time optimal H(sub 2) performance as the sampling period converges to zero. ESA

N93-31628# Groningen Rijksuniv. (Netherlands). Dept. of Mathematics.
H INFINITY-CONTROL WITH MEASUREMENT-FEEDBACK FOR PRITCHARD-SALAMON SYSTEM
Bert A. M. vanKeulen 8 Sep. 1992 73 p
(W-9211; ETN-93-94097) Avail: CASI HC A04/MF A01

The finite dimensional results for the H(infinity) control problem with measurement feedback is extended to a large class of infinite dimensional systems, allowing for a certain type of unboundedness in the input and output operators (the Pritchard-Salamon class). The main result relates the solvability of the suboptimal H(infinity) control problem to the existence of stabilizing solutions to certain operator Riccati equations. A characterization of all suboptimal controllers is given. ESA

N93-31851# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
THE OPTIMAL PROJECTION EQUATIONS FOR DIGITAL CONTROL OF INFINITE-DIMENSIONAL SYSTEMS
Florin Dan Barb and Willem L. deKoning 1993 31 p
(Rept-93-01; ETN-93-94296) Copyright Avail: CASI HC A03/MF A01

The fixed, finite order digital control of infinite dimensional systems with bounded input and output operators is addressed. The starting point is the set of necessary conditions for optimal fixed order dynamic compensation of an infinite dimensional continuous time system as developed by Bernstein and Hyland (BH) and the discrete time finite dimensional corresponding results obtained by De Koning (DeK) and Bernstein et al. One central problem of extending the main results from BH and DeK in the case of discrete time infinite dimensional systems is solved. As an immediate application, the set of necessary conditions for solving the digital control problem is given. Two related problems, the fixed, finite order modeling and state estimation of infinite dimensional discrete time systems are also considered. ESA

N93-31992 Naval Command, Control and Ocean Surveillance Center, San Diego, CA. Research, Development, Test and Evaluation.
NEURAL ATTENTIONAL SENSORY PROCESSING Professional Paper
Steve Speidel Apr. 1993 3 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A265163) Avail: CASI HC A01

The goal of this work is to develop neural-like cognitive sensory processing within non-neuronal systems. In many applications, stimuli from multiple sources are simultaneously incident upon sensor arrays, creating a composite effect that requires interpretation. The problem is to effectively separate and focus upon significant partials from within the composite sensory excitations. In an effort to formulate applicable computational models, Hopfield-type dynamical system analyses have been embraced to support adaptive optimization constructs. The adaptive constructs produce responses that are based upon comparison of temporal patterns arriving on spatially separate channels. These techniques have been applied to an example sound processing application. Graphical depiction of computational results have been produced. A comprehensive memory-driven structure for adaptive sound processing is being developed. Adaptive beamforming is used as a general paradigm supporting multiple roles in sensory processing. Key elements of the architecture are discussed. DTIC

N93-32036# Defence Research Establishment Suffield, Ralston (Alberta).
THE EFFECT OF SENSORY INPUT ON TRAJECTORIES GENERATED BY RECURRENT NEURAL NETWORKS
Simon A. Barton Jan. 1993 61 p
(AD-A264501; DRES-SR-589) Avail: CASI HC A04/MF A01

We show that the iterative signals generated by a simple recurrently connected network of only 3 sigmoidal nodes become stable, periodic, or chaotic, depending on the magnitude of a global parameter, s, that controls the steepness of the node responses. High values of s produce chaotic signals, and low values lead to stable signals, i.e. unchanging from cycle to cycle. The transition from stability, through periodicity to chaos is shown to be consistent with Feigenbaum's model of critical nonlinear systems. For large networks that are recurrently connected, the stability also depends critically on the node connection weights and biases. When these are fixed randomly, it is possible to find large systems that also show a transition from stability to chaos by the adjustment of s. When the weights and biases are allowed to evolve by a modified Hebbian rule, which depends on the internal state of the network, we find that the system becomes stable or chaotic, again depending on s, but does not appear to exhibit periodicity. We have developed a software simulation of a machine whose motion in two dimensions is controlled entirely by the iterative activity of a recurrently connected neural network. The activities of some randomly chosen nodes drive motor responses that control the movement. In the absence of external input, the machine can be made to spiral into inactivity or to follow a chaotic trajectory. If the simulated environment contains one or more emitting sources, and the machine carries sensors whose responses are fed into the network, the motion is influenced by the sensory input. DTIC

N93-32073# Brown Univ., Providence, RI.
A SOFT-COMPETITIVE SPLITTING RULE FOR ADAPTIVE TREE-STRUCTURED NEURAL NETWORKS
Michael P. Perrone 17 May 1993 6 p
(Contract N00014-91-J-1316)
(AD-A264936) Avail: CASI HC A02/MF A01

An algorithm for generating tree structured neural networks using a soft-competitive recursive partitioning rule is described. It is demonstrated that the algorithm grows robust, honest estimators. Preliminary results on a 10 class, 240 dimensional OCR classification task are presented which show that the tree out-performs backpropagation. Arguments are made which suggest why this should be the case. The connection of the soft-competitive splitting rule to the twoing rule is described. DTIC

N93-32078# Naval Command, Control and Ocean Surveillance Center, San Diego, CA. Research, Development, Test and Evaluation.
INTELLIGENT SECURITY ASSESSMENT FOR A MOBILE ROBOT Professional Paper
Richard P. Smurlo Mar. 1993 10 p
(AD-A265003) Avail: CASI HC A02/MF A01

In many robotics applications the data from different types of sensors must be fused to provide useful information about the surrounding environment. The system described here uses sensor fusion to determine the probability that an intruder is present in the vicinity of a remote robot. Several of these robots are employed in an indoor security scenario, where each robot monitors a different region of a large building and reports back intruder information to a single operator. This paper examines the realtime security assessment algorithm used by each robot to fuse information from 82 sensors of five different types, and return a single composite threat value to the operator. The algorithm described has been successfully tested on a single robot with 99% probability of detection achieved. No nuisance alarms were recorded. DTIC

N93-32082# Naval Air Warfare Center, China Lake, CA. Weapons Div.
PIECEWISE LINEAR NEURAL NETWORKS Interim Report, 1991 - 1992
W. O. Alltop Aug. 1992 24 p
(AD-A265031; NAWC-WPNS-TP-8071) Avail: CASI HC A03/MF A01

Modern weapons systems often require pattern recognition devices and algorithms. The three-layer neural network--consisting of input layer, hidden layer, and output layer--has great potential as a pattern classifier. Determining the size of the hidden layer and computing the weights are two of the primary design problems associated with layered networks. This report gives a lower bound on the number of hidden neurons as a function of the input and output dimensions and of the number of pattern prototypes.

The neurons are assumed to have piecewise linear transfer functions. DTIC

N93-32169# George Mason Univ., Fairfax, VA. Dept. of Computer Science.
AUTOMATIC TARGET RECOGNITION (ATR) USING DISTRIBUTED ASSOCIATIVE MEMORIES (DAMS) Report, period ending May 1993
Harry Wechsler 1 Jun. 1993 3 p
(Contract MDA972-91-C-0004)
(AD-A265613) Avail: CASI HC A01/MF A01

We have accomplished our schedule objectives to this date and we now have available an initial integrated version of an active vision system that incorporates the following components: (1) FOA (1) - to segment an image based on spatiotemporal information; (2) FOA (2) - to classify targets at a generic level using coarse distributed associative memories (DAMs); and (3) FOA (3) - to refine classification using zoom lens and saccade control strategies. DTIC

N93-32197# Integrated Systems, Inc., Santa Clara, CA.
SET-MEMBERSHIP IDENTIFICATION FOR ROBUST CONTROL DESIGN Final Report, 1 Sep. 1989 - 31 Mar. 1993
Robert L. Kosut 28 Apr. 1993 103 p
(Contract F49620-89-C-0119)
(AD-A265669; ISI-5752-3; AFOSR-93-0389TR) Avail: CASI HC A06/MF A02

This report describes accomplishments in developing methods of system identification for robust control design. The starting point is an a priori plant description containing both parametric and nonparametric uncertainty. The identification methods are developed under differing a priori assumptions on the parametric and nonparametric parts of the model set. For example, when a bound on the nonparametric part is known, it is shown that the parameters in the parametric part of the model are contained in either an ellipsoid or hyperboloid, depending on the data. Computational methods are very similar to standard least-squares methods and can be computed in a batch or recursive manner. The parameter set membership description is used for robust control design via a mini-max optimization problem. Other approaches explored include high-order ARX models which produce purely parametric uncertainty under standard statistical assumptions on the disturbances. A learning scheme is also investigated where the control and identification are iteratively coupled by the closed-loop. DTIC

N93-32216 California Univ., Los Angeles.
OPTIMAL CONTROL PROBLEMS FOR PARABOLIC BOUNDARY CONTROL SYSTEMS Ph.D. Thesis
Timothy John Murphy 1992 209 p
Avail: Univ. Microfilms Order No. DA9310951

Based on abstract Kuhn-Tucker theorems in Banach spaces, a version of Pontryagin's Maximum Principle that is satisfied by optimal controls for a large class of boundary control systems was derived. For a given bounded domain n in Omega in R(sup n) with boundary delta(Omega), the systems considered arise from parabolic partial differential equations in the cylinder (0,T) x Omega with nonlinear boundary conditions which generalize the Stephan-Boltzmann radiation law. Restrictions are imposed on both the control functions and the target set. The controls are applied on the lateral boundary of the cylinder; they are functions which belong to certain complete metric spaces contained in L(sup infinity)((0,T) x delta(Omega)). Since the trajectories of solutions take values in the Banach space C(omega) equipped with its customary supremum norm, the target sets will be subsets of this space. It is shown that the optimal control problems for these systems have enough structure to be able to invoke infinite dimensional nonlinear programming theorems. The control problems considered include the time optimal problem. The abstract results are interpreted to deduce that if the (0,T) is (one of) the times at which the target set Y is contained in set C(n) is hit optimally, then for almost every s is a member of the set (0,T) the corresponding optimal control u-bar(t,x) minimizes a surface integral over delta(omega). This integral is defined in terms of the solution to the adjoint of a linearized version of the given boundary control system. The results generalize previous work in which the domain Omega was restricted to be a finite interval (0,L) is contained in the set R, and where controls were only applied at one endpoint. Dissert. Abstr.

N93-32230*# Alabama Univ., Huntsville. Dept. of Electrical and Computer Engineering.
ENHANCEMENTS TO THE ENGINE DATA INTERPRETATION SYSTEM (EDIS) Research Report
Martin O. Hofmann Jul. 1993 124 p
(Contract NAS8-38609)
(NASA-CR-193363; NAS 1.26:193363) Avail: CASI HC A06/MF A02

The Engine Data Interpretation System (EDIS) expert system project assists the data review personnel at NASA/MSFC in performing post-test data analysis and engine diagnosis of the Space Shuttle Main Engine (SSME). EDIS uses knowledge of the engine, its components, and simple thermodynamic principles instead of, and in addition to, heuristic rules gathered from the engine experts. EDIS reasons in cooperation with human experts, following roughly the pattern of logic exhibited by human experts. EDIS concentrates on steady-state static faults, such as small leaks, and component degradations, such as pump efficiencies. The objective of this contract was to complete the set of engine component models, integrate heuristic rules into EDIS, integrate the Power Balance Model into EDIS, and investigate modification of the qualitative reasoning mechanisms to allow 'fuzzy' value classification. The results of this contract is an operational version of EDIS. EDIS will become a module of the Post-Test Diagnostic System (PTDS) and will, in this context, provide system-level diagnostic capabilities which integrate component-specific findings provided by other modules. Author (revised)

N93-32305# Sandia National Labs., Albuquerque, NM.
A NEURAL NETWORK APPROACH TO SEISMIC PHASE IDENTIFICATION
T. J. Draelos Mar. 1993 30 p
(Contract DE-AC04-76DP-00789)
(DE93-013601; SAND-92-1185) Avail: CASI HC A03/MF A01

An automatic phase identification system that employs a neural network approach to classifying seismic event phases is described. Extraction of feature vectors used to distinguish the different classes is explained, and the design and training of the neural networks in the system are detailed. Criteria used to evaluate the performance of the neural network approach are provided. DOE

N93-32334# Naval Postgraduate School, Monterey, CA. Dept. of Mathematics.
NEURAL NETWORK IDENTIFICATION OF KEYSTREAM GENERATORS Technical Report, Jan. - Mar. 1993
Jeffery J. Leader and James E. Heyman 6 May 1993 15 p
(AD-A265778; NPS-MA-93-016) Avail: CASI HC A03/MF A01

Applications such as stream ciphers and spread spectra require the generation of binary keystreams to implement, and the simulation of such keystreams to break. Most cryptanalytic attacks are of the known generator type, that is, they assume knowledge of the method used to generate the keystream. We show that a neural network can be used to identify the generator, and in some cases to simulate the keystream. DTIC

N93-32341*# New Mexico State Univ., Las Cruces. Computing Research Lab.
HIGH LEVEL COGNITIVE INFORMATION PROCESSING IN NEURAL NETWORKS Final Report, 1 Feb. 1989 - 31 Dec. 1992
John A. Barnden and Christopher A. Fields 31 Dec. 1992 12 p
(Grant NAGw-1592)
(NASA-CR-193296; NAS 1.26:193296) Avail: CASI HC A03/MF A01

Two related research efforts were addressed: (1) high-level connectionist cognitive modeling; and (2) local neural circuit modeling. The goals of the first effort were to develop connectionist models of high-level cognitive processes such as problem solving or natural language understanding, and to understand the computational requirements of such models. The goals of the second effort were to develop biologically-realistic model of local neural circuits, and to understand the computational behavior of such models. In keeping with the nature of NASA's Innovative Research Program, all the work conducted under the grant was highly innovative. For instance, the following ideas, all summarized, are contributions to the study of connectionist/neural networks: (1) the temporal-winner-take-all, relative-position encoding, and pattern-similarity association techniques; (2) the importation of logical combinators into connection; (3) the use of analogy-based reasoning as a bridge across the gap between the traditional

symbolic paradigm and the connectionist paradigm; and (4) the application of connectionism to the domain of belief representation/reasoning. The work on local neural circuit modeling also departs significantly from the work of related researchers. In particular, its concentration on low-level neural phenomena that could support high-level cognitive processing is unusual within the area of biological local circuit modeling, and also serves to expand the horizons of the artificial neural net field. Author (revised)

N93-32400# Universiteit Twente, Enschede (Netherlands). Faculty of Applied Mathematics.
NONLINEAR DISTURBANCE DECOUPLING AND LINEARIZATION: A PARTIAL INTERPRETATION OF INTEGRAL FEEDBACK
H. J. C. Huijberts (Technische Univ., Eindhoven, Netherlands.), H. Nijmeijer, and A. C. Ruiz Oct. 1992 27 p Sponsored by CONACYT, Mexico
(MEMO-1093; ETN-93-94306) Avail: CASI HC A03/MF A01

The purpose of the work was to study the disturbance decoupling problem for a nonlinear system in relation to the same problem for its linearization. For this reason, the relation between the solvability of the disturbance decoupling problem for a nonlinear system and its linearization around a working point was investigated. It turns out that generically the solvability of the disturbance decoupling via regular dynamic state feedback is preserved under linearization. This result gives a partial interpretation of introducing integral action in classical problem identifier control applied to nonlinear systems. The theory is illustrated by means of a worked example. The main result states that under generic conditions the problem is solvable in the nonlinear case via dynamic state feedback if and only if the linear problem is solvable. The results lead to the conclusion that the nonlinear disturbance decoupling problem is solvable via a dynamic state feedback if and only if the linearized disturbance decoupling problem is solvable via a static state feedback. ESA

N93-32413 Stanford Univ., CA. Knowledge Systems Lab.
STRATEGIC CONTROL OF REACTIVE BEHAVIOR IN INTELLIGENT AGENTS Final Report, 15 Dec. 1990 - 14 Dec. 1992
Barbara Hayes-Roth, Lee Brownston, and Anne Collinot Feb. 1993 32 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Grant AF-AFOSR-0131-91)
(AD-A264376; KSL-93-18; AFOSR-93-0212TR) Avail: CASI HC A03

A series of experiments was conducted to evaluate the real-time performance of a proposed agent architecture. The architecture is a blackboard architecture whose key features include the following: distribution of perception, action, and cognition among parallel processes; limited-capacity I/O buffers with best-first retrieval and worst-first overflow; dynamic control planning; dynamic focus of attention; and a Satisficing algorithm for the execution cycle. The experiments focus on the architecture's Satisficing algorithm for the execution cycle, which is the unit-process of all reasoning and critical to real-time performance. The execution cycle has three steps: (1) notice possible operations; (2) choose the best operation with respect to the current control plan; and (3) execute the chosen operation. Because the executed operations can change the agent's control plan, this cycle allows the agent to dynamically construct and modify plans that control its own behavior. The problem with this cycle in a real-time context is the unbounded time associated with step 1. DTIC

N93-31444*# Sterling Federal Systems, Inc., Moffett Field, CA.
NASA/ARC PROPOSED TRAINING IN INTELLIGENT CONTROL
Hamid R. Berenji *In* McDonnell-Douglas Space Systems Co., Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 99-107 (For primary document see N93-31439 12-18)
Avail: CASI HC A02/MF A04

N93-31557*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
NEURAL NETS FOR ALIGNING OPTICAL COMPONENTS IN HARSH ENVIRONMENTS: BEAM SMOOTHING SPATIAL FILTER AS AN EXAMPLE
Arthur J. Decker and Michael J. Krasowski *In its* Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 29-38 (For primary document see N93-31552 12-20)
Avail: CASI HC A02/MF A03

N93-32100*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SUPERVISORY AUTONOMOUS LOCAL-REMOTE CONTROL SYSTEM DESIGN: NEAR-TERM AND FAR-TERM APPLICATIONS
Wayne Zimmerman and Paul Backes *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 28-40 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

N93-32101*# Rensselaer Polytechnic Inst., Troy, NY.
PERFORMANCE ANALYSIS OF A ROBOTIC SYSTEM FOR SPACE-BASED ASSEMBLY Abstract only
Alan Desrochers and Hauke Jungnitz *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 41 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

N93-32109*# Air Force Systems Command, Wright-Patterson AFB, OH. Armstrong Lab.
AIR FORCE RESEARCH IN HUMAN SENSORY FEEDBACK FOR TELEPRESENCE
Ronald G. Julian *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 116-120 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

N93-32126*# Air Force Systems Command, Griffiss AFB, NY. Rome Lab.
ADVANCED ARTIFICIAL INTELLIGENCE TECHNOLOGY TESTBED
Craig S. Anken *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 226-232 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32148*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
THE COMPUTER INTEGRATED DOCUMENTATION PROJECT: A MERGE OF HYPERMEDIA AND AI TECHNIQUES
Nathalie Mathe and Guy Boy (Office National d'Etudes et de Recherches Aerospatiales, Labege, France.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 381-389 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32149*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
INFORMATION FOR THE USER IN DESIGN OF INTELLIGENT SYSTEMS
Jane T. Malin and Debra L. Schreckenghost (Mitre Corp., Houston, TX.) *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 390-39 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N93-31067# International Centre for Theoretical Physics, Trieste (Italy).
CASE STUDIES IN THE NUMERICAL SOLUTION OF OSCILLATORY INTEGRALS
G. Adam Jun. 1992 16 p
(DE92-642554; IC-92/97) Avail: CASI HC A03/MF A01 (US Sales Only)

A numerical solution of a number of 53,249 test integrals belonging to nine parametric classes was attempted by two computer codes: EAQWOM

and DO1ANF from the NAG library software. For the considered test integrals, EAQWOM was found to be superior to DO1ANF as it concerns robustness, reliability, and friendly user information in case of failure.
DOE

N93-31072# International Centre for Theoretical Physics, Trieste (Italy).
GLOBAL STABILITY OF SYSTEMS OF TWO DIFFERENTIAL EQUATIONS WITH UNSTATIONARY NONLINEARITIES, 2
Nguyen Dinh Phu Jul. 1992 7 p
(DE92-642558; IC-92/113) Avail: CASI HC A02/MF A01 (US Sales Only)

By using the method of building spirals in the plane, the author has investigated the problems of global stability of systems of two differential equations of the following type: dX/dt = A(t,X)X. In this equation, A(t,X) is a matrix, which is continuous for X--an element of the set R(exp 2)--and t greater than or equal to 0.
DOE

N93-31074# International Centre for Theoretical Physics, Trieste (Italy).
ASHTEKAR VARIABLES, SELF-DUAL METRICS, AND w(INFINITY)
V. Husain Jun. 1992 13 p
(DE92-642588; IC-92/103) Avail: CASI HC A03/MF A01 (US Sales Only)

The self-duality equations for the Riemann tensor are studied using the Ashtekar Hamiltonian formulation for general relativity. These equations may be written as dynamical equations for three divergence free vector fields on a three dimensional surface in the spacetime. An ansatz is used to explicitly solve these equations for self-dual metrics with a one Killing field symmetry. The ansatz is such that, in an appropriate coordinate system, the self-duality conditions reduce to a condition for canonical coordinates on a two dimensional surface. The resulting metrics are parametrized by an arbitrary function of two variables. As a result of this parametrization, there is an infinite dimensional symmetry algebra acting on this subset of the solution space. This is the algebra of area preserving diffeomorphisms, a particular case of which is called w(sub infinity). As an example of the procedure, a complex self-dual metric on the 4-torus (a 'non-linear graviton') is given.
DOE

N93-31079# International Centre for Theoretical Physics, Trieste (Italy).
DISSIPATION AND CONVERGENCE IN THE SYSTEMS OF DIFFERENTIAL EQUATIONS WITH UNSTATIONARY NONLINEARITIES
Nguyen Dinh Phu Jul. 1992 8 p
(DE92-642559; IC-92/114) Avail: CASI HC A02/MF A01 (US Sales Only)

The author has investigated the problems of global stability of systems of differential equations unstationary nonlinearities under type: dX/dt=A(t,X)X, where A(t,X) is a matrix, which is continuous for X an element of the set R(exp 2) and t greate r than or equal to 0. In the present paper this method of study is applied for research conditions of dissipation and convergence in a class of systems: dX/dt = F(X) + P(t). Using these results we can study convergence in a class of Lienard's equations.
DOE

N93-31128# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
STABLE NUMERICAL INTEGRATION OF DYNAMICAL SYSTEMS SUBJECT TO EQUALITY STATE-SPACE CONSTRAINTS
A. A. tenDam 16 Oct. 1991 46 p Submitted for publication
(NLR-TP-91363-U; ETN-93-94072) Avail: CASI HC A03/MF A01

Numerical simulation of constrained dynamical systems is known to exhibit stability problems even when the unconstrained system can be simulated in a stable manner. It is shown that the transformation of the continuous set of equations to a discrete set of equations is the true source of the stability problem. A new theory that allows for stable numerical integration of constrained dynamical systems is presented. The derived numerical methods are robust with respect to errors in the initial conditions and stable with respect to errors made during the integration process. As a consequence, perturbations in the initial conditions are allowed. The new theory is extended to the case of constrained mechanical systems. Some numerical results obtained when implementing the numerical method are shown.
ESA

N93-31141 Clarkson Univ., Potsdam, NY.
ITERATIVE EQUATION SOLVING TECHNIQUES IN BOUNDARY ELEMENT ANALYSIS Ph.D. Thesis
Kallavi Guru Prasad 1993 160 p
Avail: Univ. Microfilms Order No. DA9311978

This proposal describes an investigation into the prospect of using iterative equation solving techniques for the system of matrix equations that result from the discretization of Boundary Integral Equations (BIE). The overall goal of this research is to develop iterative techniques for Boundary Element Analysis (BEA) that provide a significant improvement in computational efficiency for a wide class of problems. First, preliminary results using Conjugate Gradient Normalized (CGN) method and Generalized Minimal Residual (GMRES) method with and without preconditioning are presented. Both single- and multi-zone, 2- and 3-dimensional problems are solved. An analysis of the performance of preconditioned iterative solvers in conjunction with the nature of coefficients of the operator matrix as a function of the type of boundary element formulation is then made. Design Sensitivity Analysis (DSA), where rate of change of response of an object with respect to changes in the design variables that govern its shape is formulated and solved using the iterative solvers. Reanalysis of the modified objects utilizing the information computed during a previous analysis, is also carried out. Finally, the suitability of the above mentioned solvers for implementing on emerging parallel computers is studied. In all the above topics, numerical examples will be presented to show the computational advantages of the proposed solvers over conventional direct approaches. Future work is also indicated.
Dissert. Abstr.

N93-31160# International Centre for Theoretical Physics, Trieste (Italy).
DIFFERENTIAL INCLUSIONS GOVERNED BY CONVEX AND NONCONVEX PERTURBATION OF A SWEEPING PROCESS
Truong Xuan Duc Ha Jul. 1992 18 p
(DE92-644668; IC-92/127) Avail: CASI HC A03/MF A01 (US Sales Only)

The differential inclusion of the form -dx/dt is an element of N(sub C(t))(x(t)) + F(t,x(t)), t is an element of (0,1) and x(0) = x(sub 0) is an element of C(0), is studied, where C(t) is a nonempty weakly closed moving subset of a separable Hilbert space H and N(sub C(t))(x) is the Clarke's normal cone of C(t) at the point x in C(t) and the perturbation F satisfies one of the following assumptions: (1) F is uniformly continuous on the graph of C with nonempty compact values in H, or (2) F is globally measurable, upper semicontinuous on H with nonempty convex compact values in H.
DOE

N93-31162# International Centre for Theoretical Physics, Trieste (Italy).
MULTIPARAMETRIC QUANTUM SYMPLECTIC PHASE SPACE
P. Parashar and S. K. Soni (Delhi Univ., India.) Jul. 1992 11 p
(DE93-604081; IC-92/143) Avail: CASI HC A03/MF A01 (US Sales Only)

A consistent multiparametric differential calculus on the quadratic coordinate algebra of the quantum vector space is formulated and then used as a tool to obtain a deformation of the associated symplectic phase space involving n(n-1)/2 + 1 deformation parameters. A consistent calculus on the relation subspace is also constructed. This is achieved with the help of a restricted ansatz and solving the consistency conditions to directly arrive at the main commutation structures without any reference to the R-matrix. However, the non-standard R-matrices for GL(sub r,q(sub ij))(n) and Sp(sub r,q(sub ij))(2n) can be easily read off from the commutation relations involving coordinates and derivatives.
DOE

N93-31180# Flinders Univ., Adelaide (Australia). Electronic Structure of Materials Centre.
LEAST SQUARES ORTHOGONAL POLYNOMIAL APPROXIMATION IN SEVERAL INDEPENDENT VARIABLES
R. S. Caprari Jun. 1992 29 p
(DE93-609832; ESM-46) Avail: CASI HC A03/MF A01 (US Sales Only)

This paper begins with an exposition of a systematic technique for generating orthonormal polynomials in two independent variables by application of the Gram-Schmidt orthogonalization procedure of linear algebra. It is then demonstrated how a linear least squares approximation for experimental data or an arbitrary function can be generated from these polynomials. The least squares coefficients are computed without recourse to matrix arithmetic, which ensures both numerical stability and simplicity

of implementation as a self contained numerical algorithm. The Gram-Schmidt procedure is then utilized to generate a complete set of orthogonal polynomials of fourth degree. A theory for the transformation of the polynomial representation from an arbitrary basis into the familiar sum of products form is presented, together with a specific implementation for fourth degree polynomials. Finally, the computational integrity of this algorithm is verified by reconstructing arbitrary fourth degree polynomials from their values at randomly chosen points in their domain. DOE

N93-31194*# Institute for Computer Applications in Science and Engineering, Hampton, VA.
REDUCTION METHOD WITH SYSTEM ANALYSIS FOR MULTIOBJECTIVE OPTIMIZATION-BASED DESIGN Final Report
S. Azarm and J. Sobieszczanski-Sobieski Washington Apr. 1993 20 p Submitted for publication
(Contract NAS1-19480; RTOP 505-90-52-01)
(NASA-CR-191456; NAS 1.26:191456; ICASE-93-22) Avail: CASI HC A03/MF A01

An approach for reducing the number of variables and constraints, which is combined with System Analysis Equations (SAE), for multiobjective optimization-based design is presented. In order to develop a simplified analysis model, the SAE is computed outside an optimization loop and then approximated for use by an operator. Two examples are presented to demonstrate the approach. Author (revised)

N93-31208# Institut National Polytechnique, Grenoble (France). Lab. d'Informatique Fondamentale et d'Intelligence Artificielle.
INTEGRATION AND IMPLEMENTATION OF THE AUTOMATED NATURAL DEDUCTION IN DEMONSTRATORS USING RESOLUTION Ph.D. Thesis [INTEGRATION ET IMPLEMENTATION DE MECANISMES DE DEDUCTION NATURELLE DANS LES DEMONSTRATEURS UTILISANT LA RESOLUTION]
Gilles Chaminade 1991 195 p In FRENCH
(ETN-93-94239) Avail: CASI HC A09/MF A03

The possibility of establishing a logic correspondence between the proofs of the automated deduction concerning the validity of an equation and the refutations obtained by applying the resolution principle to a set of clauses is proven. Such clauses are obtained by applying to the negation of that equation a nonstandard clause which uses the renaming technique. The simulation of the calculation of sets similar to that of Gentzern by the resolution principle is shown to be possible. Moreover, how to translate the refutations by the resolution principle into a proof of the automated deduction is also demonstrated. Improvements to the clause's structure by the remaining technique are proposed. They allow an easy search of refutations by the resolution principle. Several techniques which help to deal with the resolution principle are presented. They concern the case where resolution is applied to coordinates as well as to a clause indexing principle in order to efficiently solve several problems. An application example concerning the use of algorithms to implement a demonstrator by using resolution principle is included. ESA

N93-31224# Hebrew Univ., Jerusalem (Israel).
MATHEMATICAL INVERSION OF MULTIPLE-SCATTERING OF LASER LIGHT Ph.D. Thesis
Yair Bnayahu Aug. 1992 114 p
(DE93-609128; IA-1462) Avail: CASI HC A06/MF A02 (US Sales Only)

A model for evaluating the multiple scattering contribution, as a function of particle properties, to optical measurement systems (as LIDAR or particle-counters) is developed. This model, based on 'Successive Singular Scattering' method, uses the Monte-Carlo approach to calculate all multiple-scattering orders. Application of this model to LIDAR systems was found to agree with results obtained by previous accepted models. The advantage of our model is that it can handle multiple-scattering computations in off-axis geometries and is not limited therefore to monostatic systems (where the light propagation direction and the detector field-of-view are on the same axis). Different aspects of mathematical inversion of optical measurements containing multiple-scattering are discussed. DOE

N93-31251 Politecnico di Milano (Italy). Dipt. di Elettronica.
TIMING ANALYSIS OF REAL-TIME SYSTEMS
Miguel Felder Oct. 1992 51 p
(Rept-92-060; ETN-93-93991) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

An overview of existing approaches to formal specification and verification of timing properties at the specification level is presented. Case studies of specification formalisms and verification approaches are provided. The following case studies are discussed: Petri nets augmented to support timing requirements and temporal logic extended to deal with real time systems specifications. A very general formalism of timed Petri nets and an associated timing analysis procedure are illustrated. A subclass of the formalism and how the reduced expressiveness of the formalism can be traded for the existence of a simpler analysis algorithm are discussed. A metric temporal logic is introduced and it is outlined how timing properties can be verified. Concepts are mainly illustrated via examples and informal descriptions. ESA

N93-31285# International Centre for Theoretical Physics, Trieste (Italy).
EXISTENCE OF VIABLE SOLUTIONS FOR NONCONVEX-VALUED DIFFERENTIAL INCLUSIONS IN BANACH SPACES
Truong Xuan Duc Ha Jul. 1992 10 p
(DE92-644669; IC-92/128) Avail: CASI HC A02/MF A01 (US Sales Only)

A local existence result is proved for the viability problem dx/dt is an element of F(t,x(t)), x(0) = x(sub 0), x(t) is an element of K for all t is an element of (0,a), where F(.,.) is an integrably bounded, (strongly) measurable in t, Lipschitz continuous in x multifunction with closed values and K is a closed subset of a Banach space. DOE

N93-31288# International Centre for Theoretical Physics, Trieste (Italy).
THE nth ROOTS WITH HILBERT-SCHMIDT DEFECT OPERATOR OF NORMAL CONTRACTIONS
B. P. Duggal Aug. 1992 19 p
(DE93-608163; IC-92/215) Avail: CASI HC A03/MF A01 (US Sales Only)

Let T be a normal contraction (on a complex separable Hilbert space H into itself) with an nth root A such that the defect operator D(sub A) = (1-A*A)(sup 1/2) is of the Hilbert-Schmidt class C(sub 2). Then either A is normal or A is similar to a normal contraction. In the case in which T is hyponormal, A(sup n) = T and D(sub A) is an element of C(sub 2), A is a 'coupling' of a contraction similar to a normal contraction and a contraction which is the quasi-affine transform of a unilateral shift. These results are applied to prove a (Putnam-Fuglede type) commutatively theorem for operator valued roots of commutative analytic functions and hyponormal contractions T which have an nth root with Hilbert-Schmidt defect operator. DOE

N93-31289# International Centre for Theoretical Physics, Trieste (Italy).
THE THREE-BODY PROBLEM IN THE GROUND-STATE REPRESENTATION
A. Gonzalez Aug. 1992 16 p
(DE93-608164; IC-92/217) Avail: CASI HC A03/MF A01 (US Sales Only)

The ground-state probability density of the three-body (3B) system is used to construct a classical potential, U, whose minimum coincides exactly with the ground-state energy. The spectrum of excited states may be approximately obtained by imposing quasiclassical quantization conditions over the classical motion on U. A nontrivial one dimensional model in which this quantization condition proves to be exact is shown. For tridimensional problems, the small oscillation frequencies in states with total angular momentum L = 0 are computed. These frequencies should represent an improvement over the frequencies of triatomic molecules computed using ordinary quasiclassics for the motion of the nuclei in the molecular term. By providing a semiclassical description of the first quantum excited states, the sketched approach raises some interesting questions such as, for example, the relevance (once again! of classical chaos to quantum mechanics. DOE

N93-31303# International Centre for Theoretical Physics, Trieste (Italy).
BIHARMONIC PATTERN SELECTION
Wei Wang and E. Canessa Sep. 1992 21 p
(DE93-608186; IC-92/240) Avail: CASI HC A03/MF A01 (US Sales Only)

A model to describe fractal growth is discussed which includes effects due to long-range coupling between displacements u. The model is based

on the biharmonic equation del(sup 4)u = 0 in two-dimensional isotropic defect-free media as follows from the Kuramoto-Sivashinsky equation for pattern formation - or, alternatively, from the theory of elasticity. As a difference with Laplacian and Poisson growth models, in the model the Laplacian of u is either zero or proportional to u. Its discretization allows to reproduce a transition from dense to multibranched growth at a point in which the growth velocity exhibits a minimum similarly to what occurs within Poisson growth in planar geometry. Furthermore, in circular geometry the transition point is estimated for the simplest case from the relation r(sub l) is approximately L/epsilon(sup 1/2) such that the trajectories become stable at the growing surfaces in a continuous limit. Hence, within the biharmonic growth model, this transition depends only on the system size L and occurs approximately at a distance 60% far from a central seed particle. The influence of biharmonic patterns on the growth probability for each lattice site is also analyzed. DOE

N93-31306# International Centre for Theoretical Physics, Trieste (Italy).
ON THE SCALAR CURVATURE OF SELF-DUAL MANIFOLDS
J. Kim Aug. 1992 31 p
(DE93-608194; IC-92/203) Avail: CASI HC A03/MF A01 (US Sales Only)

LeBrun's explicit 'hyperbolic ansatz' construction of self-dual metrics on connected sums of conformally flat manifolds and CP(sup 2)'s through a systematic use of the theory of hyperbolic geometry and Kleinian groups is generalized. (This construction produces, for example, all self-dual manifolds with semi-free S(sup 1)-action and with either nonnegative scalar curvature or positive-definite intersection form.) Then a simple criterion for determining the sign of the scalar curvature of these conformal metrics is pointed out. Exploiting this, it is then shown that the sign of the scalar curvature can change on connected components of the moduli space of self-dual metrics, thereby answering a question raised by King and Kotschick. DOE

N93-31338 Deutsche Geodaetische Kommission, Munich (Germany).
DIFFERENTIAL SMALL DISPLACEMENTS AND ROTATION EXTENSIONS IN THREE DIMENSIONAL COORDINATE SYSTEMS [DIFFERENTIELLE VERSCHIEBUNGEN UND DREHSTRECKUNGEN IN DREIDIMENSIONALEN KOORDINATENSYSTEMEN]
Dieter Ehlert Frankfurt, Germany Institut fuer Angewandte Geodaesie 1991 60 p In GERMAN
(Ser-B-295; ETN-93-93533) Copyright Avail: Issuing Activity (Institut fuer Angewandte Geodaesie, Richard-Strauss-Allee 11, D-6000 Frankfurt am Main 70, Germany)

Formulae are given for transformations in cartesian and ellipsoidal coordinate systems to be used in satellite geodesy. Translations and rotation extensions are treated with coordinate origin or any given point as center. Improvement equations are also given for compensations to be used in the least squares method. Spherical approximate formulae are proposed in case of weak accuracy requirements. When a stochastic model is needed, it is explained how weight matrix or variance/covariance matrix can be obtained from the Gauss algorithm. ESA

N93-31467# Universiteit Twente, Enschede (Netherlands). Faculty of Applied Mathematics.
CURVE INTERPOLATION WITH CONSTRAINED LENGTH
Ruud M. J. vanDamme and Ren-Hong Wang (Dalian Inst. of Tech., China.) Sep. 1992 14 p Sponscred by Universiteit Twente, Enschede, Netherlands, and NNSF, China
(MEMO-1079; ETN-93-94119) Avail: CASI HC A03/MF A01

The problem of finding a curve which interpolates at given points such that (approximately) the length of the curve between each two subsequent interpolation points is equal to some given number is considered. Only the functional case is considered. An algorithm which yields an interpolating cubic polynomial spline is given. In case the data is taken from a (smooth enough) function, this spline function converges at least quadratically in the meshsize to the original one. If the mesh is 'regular enough' it is even third order accurate. An extension to the bivariate case is also given. For the univariate case it is shown that the length on each interval of this constructed spline at most differs quadratically in the meshsize from the actual lengths. Assuming regularity on the partition this estimate can also be improved by one order. ESA

N93-31470# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
DUALITY AND SENSITIVITY IN QUADRATIC OPTIMIZATION OVER A SPHERE
Olaf E. Flippo (Limburg State Univ., Maastricht, Netherlands.) and Benjamin Jansen Sep. 1992 23 p
(Rept-92-65; ETN-93-94257) Copyright Avail: CASI HC A03/MF A01

Duality is introduced for the problem of optimizing a quadratic form over an ellipsoid. Based on the duality results, some existing solution procedures are interpreted as in fact solving the dual. The duality relations also provide a natural framework for sensitivity analysis. ESA

N93-31471# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
A GENERALIZED ASYMPTOTICITY PROBLEM IN MAX ALGEBRA, THE GENERAL CASE
J. G. Braker and J. A. C. Resing (Technische Univ., Eindhoven, Netherlands.) 1992 23 p
(Rept-92-76; ETN-93-94269) Copyright Avail: CASI HC A03/MF A01

Previous notions concerning periodicity of two by two matrices in a generalized setup are extended to the case of general square matrices. The asymptotic behavior of a series of matrices is related to a particular type of circuit, called a generalized critical circuit, which is a circuit that is critical with respect to all the nodes it contains. It is shown that the asymptotic behavior is determined only by the lengths of some generalized critical circuits, the weights of arcs in these circuits and some critical paths. This formulation is an appealing extension of the concepts of periodicity and critical circuit in the 'usual' max algebra. The term 'asymptotic' may give the impression that the described behavior is only reached after a long or even infinite transient. However, the periodic regular part may be reached in only a few steps, after which the generalized critical circuits determine the future behavior. As a corollary, it is shown that each strongly connected graph contains at least one generalized critical circuit. ESA

N93-31480# Amsterdam Univ. (Netherlands). Dept. of Mathematics and Computer Science.
UNDECIDABILITY OF MODAL AND INTERMEDIATE FIRST-ORDER LOGICS WITH TWO INDIVIDUAL VARIABLES
D. M. Gabbay (Imperial Coll. of Science and Technology, London, England.) and Valentin Shehtman (Institute of New Technologies, Moscow, USSR.) Aug. 1992 33 p Revised
(ML-92-06; ETN-93-94142) Avail: CASI HC A03/MF A01

The facts of decidability and undecidability results in classical logic are recalled with references to existing monographs available for greater detail. Only logics without functional symbols, constants, and equality are considered. The case of two-variable logics is analyzed. Undecidability is shown to be very frequent. The basic idea underlying the proofs is in viewing a 3-variable classical model as a '3-dimensional cube', while a 2-variable Kripke model is a family of '2-dimensional cubes' parameterized by possible worlds, that is, it is also a '3-dimensional structure'. That is why sometimes a 3-cube can be embedded into a 2-variable Kripke model. ESA

N93-31482# Amsterdam Univ. (Netherlands). Dept. of Mathematics and Computer Science.
REALIZABILITY
A. S. Troelstra 3 Dec. 1992 64 p Submitted for publication
(ML-92-09; ETN-93-94144) Avail: CASI HC A04/MF A01

A discussion of the earliest and most basic notion of realizability, S.C. Kleene's realizability by numbers, is presented. Variations of the basic notion are discussed. The aim is not an exhaustive description of all possible proof theoretic applications of realizability, but rather at presenting illustrative examples. In particular, the following are discussed: numerical realizability; abstract realizability and function realizability; modified realizability; derivation of the fan rule; Lifschitz realizability; extensional realizability; realizability for second order arithmetic; and realizability for higher order logic and arithmetic. ESA

N93-31485# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
ON A CLASS OF GEOMETRIC VECTOR OPTIMIZATION PROBLEMS

K.-H. Elster and R. Elster (Karlsruhe Univ., Germany.) 1992 27 p
(Rept-92-51; ETN-93-94243) Copyright Avail: CASI HC A03/MF A01

A direct and an inverse duality theorem are given for an important class of geometric vector optimization problems denoted as posynom vector optimization problems. The inverse duality theorem is applied not only to solve those problems but also for gaining bounds with respect to the weighting coefficients which can be useful for the decision maker. ESA

N93-31487# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

DISTURBANCE DECOUPLING BY MEASUREMENT FEEDBACK FOR STRUCTURED SYSTEMS: A GRAPH THEORETICAL APPROACH

J. W. vanderWoude 1992 12 p
(Rept-92-53; ETN-93-94245) Copyright Avail: CASI HC A03/MF A01

Structured systems are linear systems of which each of the coefficients either is fixed to zero or is an independent free parameter. The disturbance decoupling problem by measurement feedback for such systems is studied. Sufficient conditions for the generic solvability of the problem are derived. Generic solvability means solvability in almost all cases. The conditions are stated in terms of a directed graph that can be associated to a structured system. The advantage of this is that the conditions can then be verified by means of well known and efficient combinatorial algorithms. ESA

N93-31488# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

FINITE VOLUME METHODS CONSTRUCTED BY MIXED VARIATIONAL FORMULATION. PART 2: ERROR ESTIMATES IN DISCRETE ENERGETIC NORMS

U. Risch 1992 24 p
(Rept-92-86; ETN-93-94278) Copyright Avail: CASI HC A03/MF A01

The framework of mixed variational problems is used to obtain error estimates for cell centered finite volume methods for solving the diffusion equation. While for special grids known results can be reproduced, an estimate is also presented for a new method on general quadrilateral meshes. ESA

N93-31489# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

FINITE VOLUME METHODS CONSTRUCTED BY MIXED VARIATIONAL FORMULATION. PART 1: DESCRIPTION OF THE DISCRETIZATION TECHNIQUE

U. Risch 1992 23 p
(Rept-92-85; ETN-93-94277) Avail: CASI HC A03/MF A01

Cell centered finite volume methods for solving the diffusion equation with natural or essential boundary conditions are constructed by approximating a mixed variational formulation. While for special grids known schemes are reproduced, a new proposal is put forward, especially for general quadrilateral meshes. ESA

N93-31492# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

THE GENERIC DIMENSION OF A MINIMAL REALIZATION OF AN AR-SYSTEM

J. W. vanderWoude 1992 19 p
(Rept-92-82; ETN-93-94274) Copyright Avail: CASI HC A03/MF A01

An approach towards linear systems initiated by J.C. Willems is presented. One of the features is that no a priori distinction is made between inputs and outputs but that they are both part of the so called external variable. In particular, graph theoretical methods are developed for the determination of the generic dimension of a minimal realization of a so called AR system only using the structure present in the AR equations. ESA

N93-31499# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

THE MECHANIZATION OF LAMBDA CALCULUS

W. L. vanderPoel 1992 39 p Revised
(Rept-92-60; ETN-93-94252) Copyright Avail: CASI HC A03/MF A01

Some algorithms for implementing reductions in the theory of combinators and lambda forms are described. The implementation algorithms have led to a rather mechanical view of the calculi. In particular, the process of writing down forms (that is, the construction of forms) has been integrated in the algorithms. In this way, also non-well formed formulae are considered. As long as these incomplete forms are not put into action they simply have to be regarded as partially compiled texts. A few results obtained in this unconventional way have been previously described in van der Poel. More are given. By including the compiling of forms in the calculi themselves, the language has the power to talk about itself and to change objects of the language into subjects. In general, the theory of lambda-beta+ext is followed. The identity operator is addressed and the search for the smallest 'exploder', that is, a combinator which has no lambda normal form, is described. ESA

N93-31500# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

A SINGLE RECURSION OPERATOR IS SUFFICIENT

W. L. vanderPoel 1992 18 p
(Rept-92-59; ETN-93-94251) Copyright Avail: CASI HC A03/MF A01

Results on a system for representation of numbers in the theory of combinators and lambda calculus are used. It is well known that recursive procedures can be regarded as fixed points of nonrecursive transformations. In the theory of combinators and lambda calculus there are expressions for this recursion operator, in closed form as well as by its property that the recursion operator itself is a fixed point of a very simple combinator. In a complex of many recursive (self recursive or cross recursive) functions, it can be shown that the recursion operator can be parametrized out of these forms, thereby making them all into nonrecursive, closed forms. By supplying a single recursion operator to the whole complex as a parameter, all nonrecursive operators can be made recursive. The technique is demonstrated on addition of numbers in the binary system, recursively expressed. ESA

N93-31501# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics

STRUCTURALLY STABLE QUADRATIC SYSTEMS WITHOUT LIMIT CYCLES

Robert E. Kooij and Wim T. vanHorssen 1992 22 p
(Rept-92-58; ETN-93-94250) Copyright Avail: CASI HC A03/MF A01

A study addressing the problem of the topological classification of structurally stable quadratic systems without limit cycles is presented. It is shown that the classes C1, C4, C9 and C14 in table 1 and the classes 1, 2 and 12 in table 2 of Shi Songling are not empty by constructing examples in these classes. The results imply that there are at least 43 and at most 50 classes of structurally stable quadratic systems without limit cycles. ESA

N93-31505# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

UNIQUENESS OF LIMIT CYCLES IN POLYNOMIAL SYSTEMS WITH ALGEBRAIC INVARIANTS

Andre Zegeling and Robert E. Kooij 1992 22 p
(Rept-92-72; ETN-93-94264) Copyright Avail: CASI HC A03/MF A01

The uniqueness of limit cycles is proved for quadratic systems with an invariant parabola and for cubic systems with four real line invariants. A simple proof of the uniqueness of limit cycles occuring in unfoldings of certain vector fields with codimension two singularities is given. ESA

N93-31514# Groningen Rijksuniv. (Netherlands). Dept. of Mathematics.

ROBUST STABILIZATION OF INFINITE-DIMENSIONAL SYSTEMS WITH RESPECT TO COPRIME FACTOR PERTURBATIONS

Ruth F. Curtain and A. J. Pritchard (Warwick Univ., Coventry, England.) 1992 21 p
(W-9220; ETN-93-94103) Avail: CASI HC A03/MF A01

The problem of robust stabilization of a class of infinite dimensional systems with respect to stable factor perturbations of a fixed normalized left coprime factorization is solved. The class of infinite dimensional systems is that described by the state space operators (A,B,C,D) where A generates a strongly continuous semigroup on Hilbert spaces V and W, D(A(sub v)) curved arrow to W curved arrow to V, and the system has a bounded observability map from V and a bounded controllability map onto W (the Pritchard-Salamon class). C is a member of L(W,Y) and B is a member of L(V,U), where U and Y are separable Hilbert spaces and in addition, (A,B) is admissibly exponentially stabilizable, and (A,C) is admissibly exponentially detectable. ESA

N93-31515# Universiteit Twente, Enschede (Netherlands). Faculty of Applied Mathematics.
SOME NEW RESULTS FOR CHAIN-SEQUENCE POLYNOMIALS
Erik A. vanDoorn Sep. 1992 16 p
(MEMO-1081; ETN-93-94121) Avail: CASI HC A03/MF A01

The class C of (generalized) orthogonal polynomial sequences the set (P(sub n)(x))(sup infinity)(sub n = 0), satisfying a recurrence relation of the type P(sub n)(x) = (x - c(sub n))P(sub n - 1)(x) - lambda(sub n)P(sub n - 2)(x), n greater than 1, where lambda(sub n) is not equal to 0 and the sequence the set (lambda(sub n + 1)/(c(sub n)c(sub n + 1)))(sup infinity)(sub n = 1) constitutes a chain sequence is studied. A new characterization of C in terms of the moment sequence associated with an orthogonal polynomial sequence is obtained, and is contributed to the solution of the problem of determining a (signed) orthogonalizing measure for a member of C. ESA

N93-31524# Groningen Rijksuniv. (Netherlands). Dept. of Mathematics.
ON GLOBAL BIFURCATIONS CAUSED BY THE UNFOLDING OF A HOMOCLINIC ORBIT
Ale Jan Homburg 18 Nov. 1992 11 p
(W-9221; ETN-93-94104) Avail: CASI HC A03/MF A01

A class of smooth vector fields on R the set of real numbers cubed, consisting of vector fields with a hyperbolic singularity of a kind described and a homoclinic orbit, that is, an orbit converging to the singularity both for positive and negative times, is considered. Center manifolds, generalized homoclinic orbits, and multivalued maps are all discussed, and the bifurcation theorems are presented. ESA

N93-31530# Amsterdam Univ. (Netherlands). Dept. of Mathematics and Computer Science.
A NEW DEFINITION OF SLDNF-RESOLUTION
Krzysztof R. Apt (Center for Mathematics and Computer Science, Amsterdam, Netherlands.) and Kees Doets Oct. 1992 16 p
(CT-92-03; ETN-93-94137) Avail: CASI HC A03/MF A01

A 'top-down' definition of SLDNF resolution which retains the spirit of the original definition but avoids the difficulties noted in the literature is proposed. A comparison with the 'bottom-up' definition of Kunen is made. The relation between the definition given of computed answer substitution and of finite failure and those of Kunen is clarified. ESA

N93-31531# Amsterdam Univ. (Netherlands). Dept. of Mathematics and Computer Science.
MEETING SOME NEIGHBOURS: A DYNAMIC MODAL LOGIC MEETS THEORIES OF CHANGE AND KNOWLEDGE REPRESENTATION
Maarten deRijke Sep. 1992 29 p Sponsored by Foundation for Philosophical Research, Netherlands
(LP-92-10; ETN-93-94138) Avail: CASI HC A03/MF A01

A Dynamic Modal Logic (DML) is taken as a starting point, and its connections with alternative dynamic proposals are examined. Specifically, a revision operator is defined in DML which can be shown to satisfy most of the postulates such operators are currently supposed to satisfy. Links are established with terminological logic, Veltman's update semantics, and preferential reasoning. ESA

N93-31533# Amsterdam Univ. (Netherlands). Dept. of Mathematics and Computer Science.
SEQUENT CALCULI FOR NORMAL MODAL PROPOSITIONAL LOGICS
Heinrich Wansing Nov. 1992 21 p
(LP-92-12; ETN-93-94140) Avail: CASI HC A03/MF A01

A systematic sequent style proof theory for many important systems of normal modal propositional logic based on Classical Propositional Logic (CPL) is presented. Philosophical, methodological, and computational aspects of the problem of Gentzenizing modal logic are discussed and a variant of Belnap's Display Logic is introduced. Within this proof theory, the modal axiom schemes D, T, 4, 5, and B (and some others) can be captured by characteristic structural inference rules. It is shown that for all sequent systems under consideration: cut is admissible; the subformula property holds; and all connectives are uniquely characterized. Modal systems based on substructural subsystems of CPL are also addressed. ESA

N93-31534# Amsterdam Univ. (Netherlands). Dept. of Mathematics and Computer Science.
ITERATED QUANTIFIERS
Dag Westerstaahl (Stockholm Univ., Sweden.) Nov. 1992 38 p
(LP-92-13; ETN-93-94141) Avail: CASI HC A03/MF A01

The logic of polyadic quantifiers definable by generalized quantifier prefixes, called iterations, is studied. Besides being of general logical interest, the study is also motivated by the fact that iterations provide a perspicuous way of displaying scope dependencies in formalizations of many quantified sentences in natural language. Two results by Keenan on quantifier prefixes are presented in a gereralized and global form, and some techniques used in their proofs are made explicit. These techniques are applied to logical definability issues for quantifiers, more precisely to questions as to when certain kinds of polyadic quantifiers are iterations. Among other things, necessary and sufficient conditions are given for resumption quantifiers, branching quantifiers, and cumulative quantifiers, respectively, to be iterations on finite models. ESA

N93-31544 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.
A PROPOSAL ON THE QUALITY OF THE BINARY THRESHOLDS OF A CONTOUR DETECTION [UNA PROPOSTA SULLA SCELTA DELLE SOGLIE DI BINARIZZAZIONE DI UN RILEVATORE DI CONTORNI]
Domenico Sorrenti Oct. 1991 25 p In ITALIAN
(Rept-91-075; ETN-93-93982) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

The use of a criterion for measuring the coherence of edge pixels in order to determine the best high threshold of Canny's thresholding with a hysteresis procedure is addressed. The idea is that the criterion is able to distiguish between noisy and significant edge pixels; the noise is supposed white. The image is decomposed in fixed dimension windows and the threshold selection is independently performed for each window. ESA

N93-31549# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
SOBOLEV-TYPE ORTHOGONAL POLYNOMIALS WITH A SMALL NUMBER OF REAL ZEROS
H. G. Meijer 1992 16 p
(Rept-92-64; ETN-93-94256) Copyright Avail: CASI HC A03/MF A01

Let S(sup lambda)(sub n) denote a set of polynomials orthogonal with respect to the Sobolev type inner product (F,g) = integral(upper limit 3)(lower limit -1)f(x)g(x)dx + lambda integral(upper limit 1)(lower limit -1)f'(x)g'(x)dx + integral(upper limit 3)(lower limit 1)f'(x)g'(x)dx, where lambda is greater than or equal to 0. If n is odd and lambda sufficiently large, then S(sup lambda)(sub n) has exactly one real zero. If n is even, n is greater than or equal to 2, and lambda sufficiently large, then S(sup lambda)(sub n) has exactly two real zeros. This result can be generalized to a more general inner product. ESA

N93-31550# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
EXISTENCE AND UNIQUENESS OF LIMIT CYCLES FOR A SPECIAL SYSTEM OF DIFFERENTIAL EQUATIONS ON THE PLANE
Robert E. Kooij 1992 11 p
(Rept-92-63; ETN-93-94255) Copyright Avail: CASI HC A03/MF A01

The limit cycle problem for the following system of differential equations on the plane is studied: dx/dt = -psi(y)(d psi/dy)H(x), dy/dt = q(x) + p(x)psi(y), where d psi/dy is greater than 0 and both p(x) and q(x) are polynomials of degree two is discussed. Using Dulac's criterion, necessary conditions for the existence of limit cycles are obtained. The existence of limit cycles is proved using the Andronov-Hopf theorem. After transforming the system to a Lienard system, the uniqueness of the limit cycle is proved by using a modification of a theorem by Zhang Zhifen. ESA

N93-31551# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
THE CREASE STRUCTURE OF THE KARUSH-KUHN-TUCKER SET IN PARAMETRIC OPTIMIZATION
H. Guenzel 1992 22 p
(Rept-92-62; ETN-93-94254) Copyright Avail: CASI HC A03/MF A01

Nonlinear optimization problems P(y) in R (the set of real numbers) to the n power depending on assumed parameter Y is a member of the set

R to the P power are addressed. The input data are assumed to be twice continuously differentiable in both variables x and y. Concern is on the set closed Sigma of pairs (x, y) with the following property: x is a Karush-Kuhn-Tucker point for P(y). Special interest is met by the subset Sigma of closed Sigma with the additional property, that the Mangasarian-Fromovitz constraint qualification for the problem P(y) holds at point x. For input data in general position, the following results are obtained. Firstly, the set Sigma is (open and) dense in closed Sigma. Secondly, a (nontrivial) weak crease structure for Sigma is obtained. The latter constitutes a partition of Sigma being refined by any stratification of Sigma which satisfies the frontier condition with connected elements. This main result gives a lower bound for the complexity of the real crease structure and also works as a tool in the search for stratifications. ESA

N93-31598# Norwegian Defence Research Establishment, Kjeller.
ON THE CHEBYSHEV COLLOCATION APPROXIMATION AND DOMAIN DECOMPOSITION
Carl Erik Wasberg 1 Oct. 1992 38 p
(FFI-92/7032; ETN-93-93976) Avail: CASI HC A03/MF A01

The effects of domain decomposition on the accuracy and efficiency of Chebyshev collocation approximation are addressed. Approximations to various families of functions are considered, and roundoff errors of different algorithms for the calculation of derivatives are discussed. The accumulated roundoff errors are found to be more dependent on the implementation of the algorithms than on the number of operations involved. As far as approximation is concerned, it is demonstrated that the finite floating point precision introduced an upper limit for the number of collocation points that should be used in each computational domain. ESA

N93-31612# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
GEOMETRICAL ASPECTS OF QUATERNIONS AND COMPLEX NUMBERS
J. E. Mebius 1992 9 p
(Rept-92-56; ETN-93-94248) Copyright Avail: CASI HC A02/MF A01

The relation between the algebra of quaternions and the algebra of complex numbers is explained in terms of Euclidean two, three, and four dimensional (2D, 3D, and 4D) geometry. In particular the following are examined: extension of 3D space to 4D space; 3D rotations from 4D rotations via a specific quaternion basis; and 3D rotations from 4D rotations by means of Euclidean geometry only. ESA

N93-31613# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
PERTURBATION OF THE LAPLACIAN BY THE COULOMB POTENTIAL AND A POINT INTERACTION IN L(SUP p)(R CUBED)
Wim Caspers 1992 15 p Submitted for publication
(Rept-92-55; ETN-93-94247) Copyright Avail: CASI HC A03/MF A01

Perturbations of the Laplacian operator -Delta + alpha/absolute value of x (with alpha greater than 0) by a point interaction centered at zero are defined in L(sup p)(the set of R (real numbers) cubed). This is done for p greater than 2/3 and less than 3 by extending the operator (as above) restricted to C(sup infinity)(sub 0)(R cubed backslash the set (0)), such that the extension is the negative generator of an analytic semigroup on L(sup p)(R cubed). ESA

N93-31623# Groningen Rijksuniv. (Netherlands). Dept. of Mathematics.
A NORMALLY ELLIPTIC HAMILTONIAN BIFURCATION
Henk W. Broer, Shui-Nee Chow (Georgia Inst. of Tech., Atlanta.), Yong-In Kim (Groningen Rijksuniv., Netherlands.), and Gert Vegter 1992 41 p Revised
(W-9214; W-9102; ETN-93-94098) Avail: CASI HC A03/MF A01

A universal local bifurcation analysis of an automomous Hamiltonian system around a certain equilibrium point is presented. This central equilibrium has a double zero eigenvalue, the other eigenvalues being in general position. Main emphasis is given to the two degrees of freedom case where these other eignenvalues are purely imaginary. By normal form techniques and singularity theory, unfoldings are obtained, having 'integrable' approximations related to the elliptic and hyperbolic umbilic catastrophes. ESA

N93-31627# Groningen Rijksuniv. (Netherlands). Dept. of Mathematics.
HOMOCLINIC TWIST BIFURCATIONS WITH Z2 SYMMETRY
D. G. Anronson (Minnesota Univ., Minneapolis.), S. A. vanGils (Universiteit Twente, Enschede, Netherlands.), and M. Krupa 15 Sep. 1992 22 p
(W-9215; ETN-93-94099) Avail: CASI HC A03/MF A01

Bifurcations occurring in the vicinity of a homoclinic twist point for a generic two parameter family of Z(sub 2) equivariant ordinary differential equations in four dimensions are analyzed. The results are compared with numerical results for a system of two coupled Josephson junctions with pure capacitive load. ESA

N93-31635# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
GENERIC MODAL RESOLUTION
H. deNivelle 1992 43 p
(Rept-92-90; ETN-93-94279) Copyright Avail: CASI HC A03/MF A01

Resolution in modal logic is addressed. It is shown that there is a general reason behind the different resolution methods for the various modal systems. The modal systems differ in the properties of the accessibility relation. A unified method of deriving a resolution method from the definition of a property of the accessibility relation is given. This method is shown to work for a large class of properties, called the class of conservative properties. The class of conservative properties includes the properties for some well known systems, for example K, T, S4, S5. It is shown that the resolution system that is obtained from a conservative property is sound and complete for this property, that is, it is possible to derive the empty clause from a modal formula if this modal formula in not satisfiable in a frame that satisfies this property. ESA

N93-31654# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
POINT INTERACTIONS ON BOUNDED DOMAINS
Wim Caspers and Guido Sweers 1992 18 p
(Rept-92-97; ETN-93-94286) Copyright Avail: CASI HC A03/MF A01

Some facts on point interactions in the bounded domain L(sub p)(R sup N) (the set of real numbers) are summarized and the point interaction and its resolvent operator are constructed. Pointwise estimates for the Green function psi(sub lambda) = G(sub lambda, Omega)(0,.) at zero are shown. The L(sup p) norm of psi(sub lambda) is estimated using the Gagliardo-Nirenberg inequality. The point interaction is shown to be the negative generator of an analytic semigroup on L(sup p)(Omega). ESA

N93-31655# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
ESTIMATION OF DENSITY FUNCTIONALS
Rudolf Gruebel 1992 15 p
(Rept-92-98; ETN-93-94287) Copyright Avail: CASI HC A03/MF A01

Given a sequence of independent random variables with density f, an estimate of quantities theta of the form theta = the integral phi(f(x))dx, phi a known function, is made, by inserting histograms and kernel density estimators for the unknown f. Conditions for consistency and asymptotic normality are obtained and the choice of cell size and bandwidth is discussed. ESA

N93-31661# Universidade Estadual de Paulista, Sao Paulo (Brazil). Instituto de Fisica Teorico.
THE LIPKIN MODEL SECOND ORDER PHASE TRANSITION IN THE DEFORMED su(2) ALGEBRA DESCRIPTION
D. Galetti and B. M. Pimentel Apr. 1992 14 p
(DE93-608201; IFT-P-012/92) Avail: CASI HC A03/MF A01 (US Sales Only)

The standard Lipkin model is studied in the context of the su(2) deformed algebra and a new spectrum is obtained with which a new energy gap curve is calculated. A suppression of the second order phase transition originally present is observed for the deformed case. DOE

N93-31808# International Centre for Theoretical Physics, Trieste (Italy).
Q-DEFORMED CONFORMAL SUPERALGEBRA AND ITS HOPF SUBALGEBRAS
V. K. Dobrev, J. Lukierski, J. Sobczyk, and V. N. Tolstoy (Wroclaw Univ., Poland.) Jul. 1992 19 p

(DE93-608160; IC-92/188) Avail: CASI HC A03/MF A01 (US Sales Only)

A Hopf superalgebra U(sub q)(su(2,2/2)) which is a q-deformation of the conformal superalgebra su(2,2/1) is presented in detail. The superalgebra U(sub q)(su(2,2/1)) contains as a subalgebra a q-deformed super-Poincare algebra and as Hopf subalgebras two conjugate 16-generator q-deformed super-Weyl algebras, which are q-deformation of parabolic subalgebras of su(2,2/1). Several (anti-) involutions, including the standard Cartan involution and a *-antiinvolution under which the super-Weyl algebras are *-subalgebras of U(sub q)(su(2,2/1)) were used. The q-deformed Lorentz algebra is Hopf subalgebra of both Weyl algebras and is preserved by all (anti-) involutions considered. DOE

N93-31819# Universidade Estadual de Paulista, Sao Paulo (Brazil). Instituto de Fisica Teorica.

SUPERSYMMETRIC CONSTRUCTION OF W-ALGEBRAS FROM SUPER TODA AND WZNW THEORIES

L. A. Ferreira, J. F. Gomes, R. M. Ricotta, and A. H. Zimerman Dec. 1991 26 p

(DE93-608244; IFT-P-045/91) Avail: CASI HC A03/MF A01 (US Sales Only)

A systematic construction of super W-algebras in terms of the Wess-Zumino-Novikov-Witten (WZNW) model based on a super Lie algebra is presented. These are shown to be the symmetry structure of the super Toda models, which can be obtained from the WZNW theory by Hamiltonian reduction. A classification according to the conformal spin defined by an improved energy-momentum tensor is discussed in general terms for all super Lie algebras whose simple roots are fermionic. A detailed discussion employing the Dirac bracket structure and an explicit construction of W-algebras for the cases of OSP (1,2), OSP (2,2), OSP (3,2), and D (2,1/(alpha)) are given. The N=1 and N=2 super conformal algebras are discussed in the pertinent cases. DOE

N93-31820# International Centre for Theoretical Physics, Trieste (Italy).

LIE BIALGEBRAS WITH TRIANGULAR DECOMPOSITION

N. Andruskiewitsch (Max-Planck-Inst. fuer Mathematik, Bonn, Germany.), F. Levstein (Cordoba National Univ., Argentina.), and A. Tiraboschi (Cordoba National Univ., Argentina.) Jun. 1992 20 p

(DE93-604232; IC-92/117) Avail: CASI HC A03/MF A01 (US Sales Only)

Lie bialgebras originated in a triangular decomposition of the underlying Lie algebra are discussed. The explicit formulas for the quantization of the Heisenberg Lie algebra and some motion Lie algebras are given, as well as the algebra of rational functions on the quantum Heisenberg group and the formula for the universal R-matrix. DOE

N93-31843*# Institute for Computer Applications in Science and Engineering, Hampton, VA.

ON WAVEFORM MULTIGRID METHOD Final Report

Shlomo Taasan and Hong Zhang Washington Apr. 1993 14 p Submitted for publication

(Contract NAS1-19480; NSF CCR-91-03296; RTOP 505-90-52-01)

(NASA-CR-191455; NAS 1.26:191455; ICASE-93-21) Avail: CASI HC A03/MF A01

Waveform multigrid method is an efficient method for solving certain classes of time dependent PDEs. This paper studies the relationship between this method and the analogous multigrid method for steady-state problems. Using a Fourier-Laplace analysis, practical convergence rate estimates of the waveform multigrid iterations are obtained. Experimental results show that the analysis yields accurate performance prediction. Author

N93-31847*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

DESKTOP CHAOTIC SYSTEMS: INTUITION AND VISUALIZATION

Michelle M. Bright, Kevin J. Melcher, Helen K. Qammar (Akron Univ., OH.), and Tom T. Hartley (Akron Univ., OH.) Jul. 1993 14 p Presented at the SPIE International Symposium on Chaos/Nonlinear Dynamics, San Diego, CA, 11-16 Jul. 1993; sponsored by the Society of Photo-Optical Instrumentation Engineers

(RTOP 505-62-50)

(NASA-TM-106258; E-7983; NAS 1.15:106258) Avail: CASI HC A03/MF A01

This paper presents a dynamic study of the Wildwood Pendulum, a commercially available desktop system which exhibits a strange attractor. The purpose of studying this chaotic pendulum is twofold: to gain insight in the paradigmatic approach of modeling, simulating, and determining chaos in nonlinear systems; and to provide a desktop model of chaos as a visual tool. For this study, the nonlinear behavior of this chaotic pendulum is modeled, a computer simulation is performed, and an experimental performance is measured. An assessment of the pendulum in the phase plane shows the strange attractor. Through the use of a box-assisted correlation dimension methodology, the attractor dimension is determined for both the model and the experimental pendulum systems. Correlation dimension results indicate that the pendulum and the model are chaotic and their fractal dimensions are similar. Author

N93-31857*# Institute for Computer Applications in Science and Engineering, Hampton, VA.

OPTIMAL FIXED-FINITE-DIMENSIONAL COMPENSATOR FOR BURGERS' EQUATION WITH UNBOUNDED INPUT/OUTPUT OPERATORS Final Report

John A. Burns (Virginia Polytechnic Inst. and State Univ., Blacksburg.) and Hamadi Marrekchi (Virginia Polytechnic Inst. and State Univ., Blacksburg.) Washington Apr. 1993 26 p

(Contracts NAS1-19480; NAS1-18605; F49620-92-J-0078; NSF INT-89-2249; RTOP 505-90-52-01)

(NASA-CR-191454; NAS 1.26:191454; ICASE-93-19) Avail: CASI HC A03/MF A01

The problem of using reduced order dynamic compensators to control a class of nonlinear parabolic distributed parameter systems was considered. Concentration was on a system with unbounded input and output operators governed by Burgers' equation. A linearized model was used to compute low-order-finite-dimensional control laws by minimizing certain energy functionals. Then these laws were applied to the nonlinear model. Standard approaches to this problem employ model/controller reduction techniques in conjunction with linear quadratic Gaussian (LQG) theory. The approach used is based on the finite dimensional Bernstein/Hyland optimal projection theory which yields a fixed-finite-order controller. Author (revised)

N93-31912# Universidade Estadual de Paulista, Sao Paulo (Brazil). Instituto de Fisica Teorica.

ON TWO-CURRENT REALIZATION OF KP HIERARCHY

H. Aratyn, L. A. Ferreira, J. F. Gomes, and A. H. Zimerman Jun. 1992 30 p

(DE93-609917; IFT-P-020/92) Avail: CASI HC A03/MF A01 (US Sales Only)

A simple description of the KP hierarchy and its multi-Hamiltonian structure is given in terms of two Bose currents. A deformation scheme connecting various W-infinity algebras and relation between two fundamental nonlinear structures are discussed. Properties of Faa di Bruno polynomials are extensively explored in this construction. Applications of our method are given for the Conformal Affine Toda model, WZNW models, and discrete KP approach to Toda lattice chain. DOE

N93-31999# Wisconsin Univ., Madison. Center for Mathematical Sciences.

APPROXIMATION ORDERS OF AND APPROXIMATION MAPS FROM LOCAL PRINCIPAL SHIFT-INVARIANT SPACES

Amos Ron May 1993 23 p

(Contract DAAL03-G-90-0090; NSF DMS-91-02857)

(AD-A265038; CMS-TR-93-12) Avail: CASI HC A03/MF A01

Approximation orders of shift-invariant subspaces generated by the shifts of one compactly supported function are considered. In that course, explicit approximation maps are constructed. The approach avoids quasi-interpolation and applies to stationary and non-stationary refinements. The general results are specialized to box spline spaces, to obtain new results on their approximation orders. DTIC

N93-32017# Minnesota Univ., Minneapolis. Inst. for Mathematics and Its Applications.

LINEAR ALGEBRA FOR SIGNAL PROCESSING Final Report, 1 Feb. 1992 - 31 Jan. 1993

Avner Friedman and Willard Miller, Jr. 7 Apr. 1993 20 p

(Contract F49620-92-J-0149)
(AD-A264677; AFOSR-93-0320TR) Avail: CASI HC A03/MF A01

This grant supported research in Applied Linear Algebra for Signal Processing, part of the IMA 1991-92 program in Applied Linear Algebra. Specifically the grant supported 12 one-month visitors during the Apr.-May 1992 period devoted to signal processing and also provided support for the Liner Algebra for Signal Processing workshop (6-10 Apr. 1992). DTIC

N93-32076# California Univ., Berkeley. Dept. of Mathematics.
CONFERENCE: THREE DECADES OF NUMERICAL LINEAR ALGEBRA AT BERKELEY Interim Report
James Demmel 30 Apr. 1993 22 p Conference held in Berkeley, CA, 17 Oct. 1993
(Contract N00014-92-J-1561)
(AD-A264964) Avail: CASI HC A03/MF A01

Abstracts of papers submitted for this conference and a special issue of the Journal of Numerical Linear Algebra with Applications (JNLAA) are presented. DTIC

N93-32170# Naval Command, Control and Ocean Surveillance Center, San Diego, CA. RDT and E Div.
INFINITE VOLUME EXTRAPOLATIONS OF FINITE CLUSTER CALCULATIONS. HOW CORRECT ARE THESE?
S. Mazumdar, F. Guo, D. Guo, K.-C. Ung, and J. T. Gammel May 1993 26 p
(AD-A265648) Avail: CASI HC A03/MF A01

Extrapolations of numerical data obtained from finite cluster calculations to the infinite volume limit can often give incorrect results. We discuss four separate cases: (1) the intensity of the lowest two-photon absorption in the infinite polyene; (2) bond alternation in the infinite polyene; (3) Cooper type pairing in the simple Hubbard model; and (3) pairing within the extended Hubbard model. DTIC

N93-32200*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
A CRITICAL COMPARISON OF SEVERAL LOW REYNOLDS NUMBER k-EPSILON TURBULENCE MODELS FOR FLOW OVER A BACKWARD FACING STEP
C. J. Steffen, Jr. Jun. 1993 15 p Presented at the AIAA 29th Joint Propulsion Conference and Exhibit, Monterey, CA, 28-30 Jun. 1993; sponsored by AIAA, SAE, ASME, and ASEE
(Contract NCC3-233; RTOP 505-90-5K)
(NASA-TM-106173; AIAA Paper 93-1927; CMOTT-93-9; E-7873; NAS 1.15:106173) Avail: CASI HC A03/MF A01

Turbulent backward-facing step flow was examined using four low turbulent Reynolds number k-epsilon models and one standard high Reynolds number technique. A tunnel configuration of 1:9 (step height: exit tunnel height) was used. The models tested include: the original Jones and Launder; Chien; Launder and Sharma; and the recent Shih and Lumley formulation. The experimental reference of Driver and Seegmiller was used to make detailed comparisons between reattachment length, velocity, pressure, turbulent kinetic energy, Reynolds shear stress, and skin friction predictions. The results indicated that the use of a wall function for the standard k-epsilon technique did not reduce the calculation accuracy for this separated flow when compared to the low turbulent Reynolds number techniques. Author (revised)

N93-32284# International Centre for Theoretical Physics, Trieste (Italy).
ON THE REAL SYMMETRIC INVERSE EIGENVALUE PROBLEM
M. A. Shalaby Oct. 1992 12 p
(DE93-619667; IC-92/324) Avail: CASI HC A03/MF A01 (US Sales Only)

The inverse eigenvalue problem of a real symmetric matrix, dependent on several parameters, is studied. A new solution, based on obtaining perturbation expansions of the eigensystem of such matrix, is presented. The proposed solution is a modification of the well-known Newton method, based on investigating the analyticity of the eigenvalues and the eigenvector of the matrix. DOE

N93-32285# International Centre for Theoretical Physics, Trieste (Italy).
A REMARK ABOUT THE MEAN CURVATURE
Weitao Zhang Nov. 1992 7 p
(DE93-619668; IC-92/381) Avail: CASI HC A02/MF A01 (US Sales Only)

In this paper, we give an integral identity about the mean curvature in Sobolev space H(sub 0)(sup 1)(Omega) intersection H(sup 2)(Omega). Suppose the mean curvature on Gamma = (delta)(Omega) is positive, we prove some inequalities of the positive mean curvature and propose some open problems. DOE

N93-32286# International Centre for Theoretical Physics, Trieste (Italy).
FINITE-DIMENSIONAL APPROXIMATION FOR OPERATOR EQUATIONS OF HAMMERSTEIN TYPE
N. Buong Nov. 1992 14 p
(DE93-619669; IC-92/384) Avail: CASI HC A03/MF A01 (US Sales Only)

The purpose of this paper is to establish convergence rate for a method of finite-dimensional approximation to solve operator equation of Hammerstein type in real reflexive Banach space. In order to consider a numerical example an iteration method is proposed in Hilbert space. DOE

N93-32287# International Centre for Theoretical Physics, Trieste (Italy).
CONVERGENCE RATES AND FINITE-DIMENSIONAL APPROXIMATIONS FOR NONLINEAR ILL-POSED PROBLEMS INVOLVING MONOTONE OPERATORS IN BANACH SPACES
Buong Nguyen Nov. 1992 11 p
(DE93-619670; IC-92/385) Avail: CASI HC A03/MF A01 (US Sales Only)

The purpose of this paper is to investigate convergence rates for an operator version of Tikhonov regularization constructed by dual mapping for nonlinear ill-posed problems involving monotone operators in real reflective Banach spaces. The obtained results are considered in combination with finite-dimensional approximations for the space. An example is considered for illustration. DOE

N93-32315# Naval Postgraduate School, Monterey, CA. Dept. of Mathematics.
ESTIMATING THE SPATIAL EXTENT OF ATTRACTORS OF ITERATED FUNCTION SYSTEMS Technical Report, Jan. - Apr. 1993
D. Canright 27 Apr. 1993 23 p
(AD-A265856; NPS-MA-93-017) Avail: CASI HC A03/MF A01

As Barnsley, Demko, and others have shown, one effective method for producing fractal shapes (in any number of dimensions) is with Iterated Function Systems (IFSs), using the 'Chaos Game' algorithm (or some deterministic algorithm). This approach has been used for producing naturalistic shapes, finding interpolants to given data and fractal approximations of given functions, and even for visualizing arbitrary discrete sequences. Indeed, any contractive IFS will give an attractor (usually of fractal dimension); thus, it is possible to generate IFSs at random to explore the graphical possibilities, as is done in some educational software. Similarly, because the attractor depends continuously on the parameters in the IFS, small data sets from any source could be encoded as IFSs for visualization. DTIC

N93-32347# Loughborough Univ. of Technology (England). Dept. of Mathematical Sciences.
GENERALISED CURVATURE CONTINUOUS RATIONAL CUBICS
M. C. Harrison, W. L. R. Ip, and J. V. Ball (Birmingham Univ., England.) Nov. 1992 29 p
(MATHS-Rept-A-180; ETN-93-94036) Avail: CASI HC A03/MF A01

Rational cubic parametric curve segments expressed in homogeneous coordinates are given. The most general form of rational cubic parametric curve segment that joins adjacent segments with curavature continuity, that is a rational G(squared) spline, is given in terms of a set of joint parameters. Rational B-splines and rational Beta-splines are shown to be special cases of it. Sample results show the effects of varying the point parameters in the uniform parameter case. More convenient shape control is obtained than with rational B- or Beta-splines. ESA

N93-32373*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
ROBUST STABILITY OF SECOND-ORDER SYSTEMS Semiannual Status Report, 24 Feb. - 23 Aug. 1993

C.-H. Chuang 19 Aug. 1993 18 p
(Grant NAG1-1397)
(NASA-CR-193624; NAS 1.26:193624) Avail: CASI HC A03/MF A01

A feedback linearization technique is used in conjunction with passivity concepts to design robust controllers for space robots. It is assumed that bounded modeling uncertainties exist in the inertia matrix and the vector representing the coriolis, centripetal, and friction forces. Under these assumptions, the controller guarantees asymptotic tracking of the joint variables. A Lagrangian approach is used to develop a dynamic model for space robots. Closed-loop simulation results are illustrated for a simple case of a single link planar manipulator with freely floating base. Author

N93-32390 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.
ADAPTIVE RLS IDENTIFICATION WITH GENERALIZED FORGETTING TECHNIQUES
M. Campi and F. Lorito 1992 11 p Sponsored in part by Ministry of University and Research and Scientific Technology, Italy and CNR
(Rept-92-037; ETN-93-93984) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

For the identification of time varying systems, a widely used technique is the Recursive Least Squares algorithm with Forgetting Factor (RLS-FF). The technique's basic idea is that as a new datum becomes available, discount all data collected in the past of the same rate mu less than 1. The discount mechanism of RLS-FF is critically analyzed. It is shown that such a mechanism is not flexible enough in certain situations in that it does not allow to achieve a tradeoff between tracking capabilities and disturbance rejection features. On the grounds of these considerations, a new recursive forgetting algorithm which incorporates a generalized discounting device is proposed. The analysis, mainly based on an approximate frequency characterization of the estimation error, shows the increased flexibility of the new algorithm and puts into light how it can lead to better performances with respect to classical forgetting factors techniques. ESA

N93-32394# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
PARALLEL JACOBI ITERATION IN IMPLICIT STEP-BY-STEP METHODS
P. J. vanderHouwen and B. P. Sommeijer Sep. 1992 15 p
(CWI-NM-R9218; ETN-93-94146) Copyright Avail: CASI HC A03/MF A01

An iteration scheme is described to solve the implicit relations that result from the application of an implicit integration method to an Initial Value Problem (IVP). In this iteration scheme the amount of implicitness is still free so as to comprise a large variety of methods running the gamut from fully explicit to fully implicit. In the intermediate variants, the influence of the Jacobian matrix of the problem is gradually increased. Special emphasis is placed on the 'stage value Jacobi' iteration which uses only the diagonal of the Jacobian matrix. The convergence of this method depends on the diagonal dominance of the Jacobian. Another characteristic of this scheme is that it allows for massive parallelism: for a d dimensional IVP, d uncoupled systems of dimension s have to be solved, where s is the number of stages in the underlying implicit method. ESA

N93-32398# Universiteit Twente, Enschede (Netherlands). Faculty of Applied Mathematics.
CYCLES IN TOUGH GRAPHS: UPDATING THE LAST FOUR YEARS
D. Bauer (Stevens Inst. of Tech., Hoboken, NJ.), E. Schmeichel (San Jose State Univ., CA.), and H. J. Veldman Oct. 1992 19 p
(Contract MDA904-89-H-2008; NSF DMS-92-06991)
(MEMO-1091; ETN-93-94304) Avail: CASI HC A03/MF A01

A survey on progress made in the last four years toward understanding the relationship between the toughness of a graph and its cycle structure is given. Recent results relating toughness and circumference are discussed. First, results involving some assumption about the vertex degrees of the graph are considered. Then, what is known if no such assumption is made, is examined. The impact of toughness and minimum vertex degree to the existence of a 2 factor is considered. Some recent progress made on a number of Chvatal's conjectures and miscellaneous results on tough graphs are included. ESA

N93-32399# Universiteit Twente, Enschede (Netherlands). Faculty of Applied Mathematics.
SMALLEST REGULAR GRAPHS WITH GIVEN DIAMETER
F. Goebel Oct. 1992 9 p
(MEMO-1092; ETN-93-94305) Avail: CASI HC A02/MF A01

For given natural numbers K and D, the smallest n for which a K-regular graph on n points with diameter D exists is determined. Let n,k,D be natural numbers. A triple (n,k,D) is said to be possible if there exists a connected k-regular graph on n points with diameter D. In the sequel K is taken to be less than or equal to 3 and greater than or equal to (n-2)/2. The asymptotic behavior of the smallest n for which (n,k,d) is possible is proven, even for fixed K. ESA

N93-32401# Universiteit Twente, Enschede (Netherlands). Faculty of Applied Mathematics.
A NOTE ON DOMINATING CYCLES IN 2-CONNECTED GRAPHS
D. Bauer (Stevens Inst. of Tech., Hoboken, NJ.), E. Schmeichel (San Jose State Univ., CA.), and H. J. Veldman Oct. 1992 11 p
(Contract MDA904-89-H-2008; NSF DMS-92-06991)
(MEMO-1094; ETN-93-94307) Avail: CASI HC A03/MF A01

Let G be a 2-connected graph on n vertices such that $d(x)+d(y)+d(z)$ is greater than or equal to n for all triples of independent vertices x,y,z. It is proven that every longest cycle in G is a dominating cycle unless G is a spanning subgraph of a graph belonging to one of four easily specified classes of graphs. Only finite undirected graphs with no loops or multiple edges are considered. Application of some theorems are given. ESA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N93-31307# International Centre for Theoretical Physics, Trieste (Italy).
DISTRIBUTION FUNCTION OF EXCITATIONS IN SYSTEMS WITH FRACTIONAL STATISTICS
A. P. Protogenov Aug. 1992 8 p
(DE93-608195; IC-92/212) Avail: CASI HC A02/MF A01 (US Sales Only)

The distribution function of low-energy excitations in 2+1D systems was considered. It is shown that in these systems the quantum distribution function differs from the usual one by having a finite value of the entropy of linked braids. DOE

N93-31430 National Inst. of Standards and Technology, Gaithersburg, MD. Statistical Engineering Div.
SURVEILLANCE SCHEMES WITH APPLICATIONS TO MASS CALIBRATION
M. Pollak, C. Croarkin, and C. Hagwood Apr. 1993 74 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB93-181881; NISTIR-5158) Avail: CASI HC A04

One of the activities at the NIST is calibrating mass standards. In order to ensure the quality of calibration, the NIST personnel monitor the values of check standards over time. The current standard surveillance technique is a Shewhart control chart with 3 sigma limits. Here we explore the applicability of other, recently developed, control charts. While Shewhart charts are typically designed to detect large changes, the schemes regarded here are geared towards detecting medium-sized ones. Some of these procedures are parametric, others are nonparametric. They are applied here to a sequence of measurements of mass standards, made at the NIST over a period of time. Two types of surveillance problems are regarded: monitoring for a change in mean and monitoring for a change of standard deviation. The control charts considered are shown to be effective. NTIS

N93-31463 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.
RLS TECHNIQUES WITH GENERALIZED FORGETTING DEVICES FOR THE IDENTIFICATION OF TIME-VARYING SYSTEMS
Fabrizio Lorito 1992 17 p Sponsored by Ministry of University and Research and Scientific Technology

(Rept-92-069; ETN-93-93999) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

A tradeoff between tracking capabilities and disturbance rejection features is inherent in the problem of identifying time varying dynamical systems. In the classical Recursive Least Squares (RLS) algorithm with Exponential Forgetting (EF) a single free parameter (the Forgetting Factor) is available to cope with such a compromise. To gain flexibility with respect to this algorithm, the class of General Least Squares is introduced. The performances of the algorithms of this class are analyzed via an approximate spectral analysis of the corresponding estimation error. By generalizing the EF algorithm a new recursive identification algorithm is introduced. It is shown that, thanks to an increased flexibility, this new technique displays better performances than the classical EF in solving the above mentioned compromise. ESA

N93-31464 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.

MANAGING SEMANTIC HETEROGENEITY WITH PRODUCTION RULES AND PERSISTENT QUEUES

Stefano Ceri and Jennifer Widom (International Business Machines Corp., San Jose, CA.) Oct. 1992 31 p

(Rept-92-078; ETN-93-94001) Avail: Issuing Activity (Politecnico di Milano, Piazzo Leonardo da Vinci 32, 20133 Milan, Italy)

Production rules and persistent queues are shown to provide together a convenient mechanism for maintaining consistency in semantically heterogeneous multidata base environments. A specification language and methods for automatically deriving production rules are described. These rules maintain existence dependencies, in which the presence of data in one data base implies the presence of related data in another, and value dependencies, in which the value of data in one database is based on the value of related data in another. The production rules derived from dependency specifications use persistent queues to monitor and maintain the dependencies automatically, asynchronously, incrementally, and correctly. ESA

N93-31476 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazioni.

MODELING USERS' BEHAVIOR AND THREATS FOR SECURITY

Silvana Castano Oct. 1992 18 p

(Rept-92-071; ETN-93-94000) Avail: Issuing Activity (Politecnico di Milano, Piazzo Leonardo da Vinci 32, 20133 Milan, Italy)

An auditing system for detecting security violations during system use is presented. Detection techniques are based on the hypothesis that a correlation exists between threats and an anomalous behavior of the system users. Control rules are defined integrating both the user's behavior and threat detection. Once suspicious and dangerous situations are detected, an alarm is generated to the system administrator, and the level of danger of the involved users is updated. ESA

N93-31491# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

EFFICIENT ESTIMATION OF THE MEAN FOR INTERVAL CENSORING, CASE 2

Ronald Geskus 1992 27 p

(Rept-92-83; ETN-93-94275) Copyright Avail: CASI HC A03/MF A01

An attempt to derive the information bound for estimation of the mean in the model of interval censoring with two observation points is made. The theory of information bounds for smooth functionals is introduced and the above problem is solved for two choices of distributions. Uniform distributions are considered. Here, the Legendre polynomials on the interval (0,1) play an important role and the solution arises as a continued fraction expansion. The distributions are then chosen such that the answer can be formulated more explicitly. ESA

N93-31503# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.

REGULARITY OF STOCHASTIC PROCESSES: A THEORY BASED ON DIRECTIONAL CONVEXITY

Ludolf E. Meester and J. George Shanthikumar (California Univ., Berkeley.) 1992 25 p

(Grant NSF ECS-88-11234)

(Rept-92-70; ETN-93-94262) Copyright Avail: CASI HC A03/MF A01

A notion of regularity ordering called Directionally Convex Ordering (DCX) among stochastic processes is defined. Examples of doubly stochastic Poisson and Markov revewal processes where such ordering is prevalent are given. The class of segmented processes introduced by Chang, Chao, and Pinedo is shown to provide a rich set of stochastic processes where the DCX ordering can be commonly encountered. When the input processes to a large class of queueing systems (single stage as well as networks) are DCX ordered, so are the processes associated with these queuing systems. For example, if two input processes to a tandem ./M/c arrow /M/c arrow ... arrow /M/c queueing system are DCX ordered so are the number of customers in the system. The concept of directionally convex functions and the notion of multivariate stochastic convexity are employed in the analysis. ESA

N93-31618# Technische Univ., Eindhoven (Netherlands).

SELECTION BY SIMULATION: A WORK SAMPLE APPROACH TO THE SELECTION OF PROCESS ALGEBRAS Ph.D. Thesis

Astrid Ridderbos 1992 185 p Sponsored by Arco Chemical Holland, Netherlands; Netherlands Refining Co.; DSM, Netherlands; Exxon Chemical Holland, Netherlands; Hoescht Holland, Netherlands; Kema, Netherlands; Shell Chemical Holland, Netherlands; and Stamicarbon

(ISBN-9-09-005483-9; ETN-93-94052) Copyright Avail: CASI HC A09/MF A02

The application of the work sample approach to the development of a selection instrument for process operators is investigated. Two approaches to the development of a selection instrument, sign versus sample, are examined and underlying assumptions of either approach are discussed. The literature on the work sample approach is reviewed and important concepts such as reliability and validity with regard to selection tests are discussed. The design cycle as used in the engineering sciences is introduced as a framework for the development of the work sample. Emphasis is on the iterative and cyclic character of the design process. Key elements of the process operator's control task are identified, construction of several provisional versions of the work sample is described and results of pilot experiments for 'tuning' the instrument are presented. The design of four validity studies in the 'final' version of the work sample is outlined. Results of these validation experiments are described. An evaluation of the most important findings is provided and the usefulness of the work sample approach for selection of process operators is discussed. ESA

N93-32003# Colorado State Univ., Fort Collins. Dept. of Statistics.

MULTIVARIATE PROBLEMS OF STATISTICS, COMBINATORICS, RELIABILITY, AND SIGNAL PROCESSING Final Report, 1 Nov. 1990 - 31 Oct. 1992

J. Srivastava 31 Oct. 1992 8 p

(Grant AF-AFOSR-0031-91)

(AD-A265213; AFOSR-93-0360TR) Avail: CASI HC A02/MF A01

A large amount of work, of high quality, was produced under this grant. The PI gave invited talks at ten technical meetings and conferences, was elected to the membership of the Third World Academy of Science, and had four papers published, with six more being accepted for publication. Four papers have been submitted for publication and eight papers are in final preparation. DTIC

N93-32016# Tennessee Univ., Knoxville.

STATISTICAL AND NUMERICAL METHODS IN CONTROL AND IDENTIFICATION Final Report, 1 Oct. 1990 - 31 Dec. 1992

Ben Fitzpatrick 31 Dec. 1992 10 p

(Grant AF-AFOSR-0021-91)

(AD-A264676; AFOSR-93-0326TR) Avail: CASI HC A02/MF A01

We report on several research projects funded by grant AFOSR-91-0021. Substantial progress has been made in statistical areas, especially in Bayesian analysis and empirical distributions, and in analysis of inverse problems in structures and groundwater modeling. Our numerical studies have focused on parallel statistical computing in inverse problems, identification in conservation laws, cooling of viscoelastic films, and a general problem involving the estimation of measures. We have computing facilities and the structures lab of Phillips Lab in order to tailor the statistical and numerical techniques under study to those problems of interest to AFOSR. We have also visited AFESC at Tyndall AFB to discuss mathematical

issues in groundwater modeling problems of interest to the Air Force. DTIC

N93-32392# Universiteit Twente, Enschede (Netherlands). Faculty of Applied Mathematics.
BLOCKING PROBABILITIES IN A LOSS SYSTEM WITH ARRIVALS IN GEOMETRICALLY DISTRIBUTED BATCHES AND HETEROGENEOUS SERVICE REQUIREMENTS
E. A. vanDoorn and F. J. M. Panken (Nijmegen Univ., Netherlands.) Aug. 1992 11 p
(MEMO-1074; ETN-93-94115) Avail: CASI HC A03/MF A01

A generalization of the classical Erlang loss model is analyzed. Customers of several types contend for access to a service facility consisting of a finite number of servers. Each customer requires a fixed number of servers simultaneously during an exponentially distributed service time. Each customer is blocked on arrival if this requirement cannot be met. Customers of each type arrive in geometrically distributed batches, while the arrival of batches of each type is governed by a Poisson process. All relevant parameters may be type dependent. The steady state distribution of the number of customers of each type in the system and the blocking probabilities experienced by each customer type are obtained. The connection between the model at hand and a method proposed by Delbrouck, for estimating blocking probabilities in an incompletely specified setting, is demonstrated. ESA

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N93-31145*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
MINIMIZE SYSTEM COST BY CHOOSING OPTIMAL SUBSYSTEM RELIABILITY AND REDUNDANCY
Ronald C. Suich (California State Univ., Fullerton.) and Richard L. Patterson Jan. 1993 7 p Presented at the Reliability and Maintainability Symposium, Atlanta, GA, 25-28 Jan. 1993
(RTOP 506-41-41)
(NASA-TM-106251; E-7973; NAS 1.15:106251) Avail: CASI HC A02/MF A01

The basic question which we address in this paper is how to choose among competing subsystems. This paper utilizes both reliabilities and costs to find the subsystems with the lowest overall expected cost. The paper begins by reviewing some of the concepts of expected value. We then address the problem of choosing among several competing subsystems. These concepts are then applied to k-out-of-n: G subsystems. We illustrate the use of the authors' basic program in viewing a range of possible solutions for several different examples. We then discuss the implications of various solutions in these examples. Author

N93-31869*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
AUTOMATIC SPECIFICATION OF RELIABILITY MODELS FOR FAULT-TOLERANT COMPUTERS
Carlos A. Liceaga and Daniel P. Siewiorek (Carnegie-Mellon Univ., Pittsburgh, PA.) Washington Jul. 1993 70 p
(RTOP 505-64-10-07)
(NASA-TP-3301; L-17144; NAS 1.60:3301) Avail: CASI HC A04/MF A01

The calculation of reliability measures using Markov models is required for life-critical processor-memory-switch structures that have standby redundancy or that are subject to transient or intermittent faults or repair. The task of specifying these models is tedious and prone to human error because of the large number of states and transitions required in any reasonable system. Therefore, model specification is a major analysis bottleneck, and model verification is a major validation problem. The general unfamiliarity of computer architects with Markov modeling techniques further increases the necessity of automating the model specification. Automation requires a general system description language (SDL). For practicality, this SDL should also provide a high level of abstraction and be easy to learn and use. The first attempt to define and implement an SDL with those characteristics is presented. A program named Automated Reliability Modeling (ARM) was constructed as a research vehicle. The ARM program uses a graphical interface as its SDL, and it outputs a Markov reliability model specification formulated for direct use by programs that generate and evaluate the model. Author (revised)

N93-32013# Army War Coll., Carlisle Barracks, PA.
THE ARMY AND MILITARY IN SPACE Study Project
Gary E. Heuser 15 Apr. 1993 39 p
(AD-A264581) Avail: CASI HC A03/MF A01

Considering the National and Department of Defense Space Policy, current fiscal constraints, and a revised world environment, an examination is conducted of the Army's present involvement in the space community and how that achieves the national security strategy. The importance of space-related systems supporting the regional warfighting Commanders in Chief is assessed in relation to the Army's role. DTIC

N93-32350*# Dayton Univ., OH. Dept. of Engineering Management and Systems.
ENHANCED METHODS FOR DETERMINING OPERATIONAL CAPABILITIES AND SUPPORT COSTS OF PROPOSED SPACE SYSTEMS Final Report
Charles Ebeling Jun. 1993 234 p
(Grant NAG1-1327)
(NASA-CR-193265; NAS 1.26:193265) Avail: CASI HC A11/MF A03

This report documents the work accomplished during the first two years of research to provide support to NASA in predicting operational and support parameters and costs of proposed space systems. The first year's research developed a methodology for deriving reliability and maintainability (R & M) parameters based upon the use of regression analysis to establish empirical relationships between performance and design specifications and corresponding mean times of failure and repair. The second year focused on enhancements to the methodology, increased scope of the model, and software improvements. This follow-on effort expands the prediction of R & M parameters and their effect on the operations and support of space transportation vehicles to include other system components such as booster rockets and external fuel tanks. It also increases the scope of the methodology and the capabilities of the model as implemented by the software. The focus is on the failure and repair of major subsystems and their impact on vehicle reliability, turn times, maintenance manpower, and repairable spares requirements. The report documents the data utilized in this study, outlines the general methodology for estimating and relating R&M parameters, presents the analyses and results of application to the initial data base, and describes the implementation of the methodology through the use of a computer model. The report concludes with a discussion on validation and a summary of the research findings and results. Derived from text

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N93-31083# International Centre for Theoretical Physics, Trieste (Italy).
INTUITIVE APPROACH TO MODIFIED GYROKINETIC EQUATION AND NUMERICAL CONFIRMATION
C. Y. Chen and S. M. Mahajan Jul. 1992 11 p
(DE93-604671; IC-92/157) Avail: CASI HC A03/MF A01 (US Sales Only)

It has been revealed in a recent paper that although the gyrokinetic equation based on separating the total perturbed distribution function into adiabatic and nonadiabatic parts is accepted as a standard approach, the method has substantial problems, i.e., the theory is inherently gauge-dependent and suffers some conceptual difficulties. An intuitive approach to modify the standard theory is proposed. The approach may help to put the problem in clearer perspective. Each term of the standard gyrokinetic equation is analyzed in light of its physical and mathematical implication, and then corresponding modification follows from suitable arguments. In particular, it is argued that gyrating particles in a magnetized plasma cannot adiabatically respond to a perpendicular wave-like field so that the 'adiabatic' terms in the equation should be treated equally with

other terms and should be gyro-averaged to make the gyrokinetic effect emerge. It is motivated that as many as possible heuristic arguments can be discussed. After establishing the modified gyrokinetic equation, our approach is verified numerically with the code developed on the Runge-Kutta algorithm. DOE

N93-31102# International Centre for Theoretical Physics, Trieste (Italy).
NORMAL FORMS OF INVARIANT VECTOR FIELDS UNDER A FINITE GROUP ACTION
F. SanchezBringas Jul. 1992 8 p
(DE93-604134; IC-92/154) Avail: CASI HC A02/MF A01 (US Sales Only)

Let Gamma be a finite subgroup of GL(n,C). This subgroup acts on the space of germs of holomorphic vector fields vanishing at the origin in C(sup n). A theorem of invariant conjugation to a normal form and linearization for the subspace of invariant elements is proved and a description of these normal forms in dimension n = 2 is given. DOE

N93-31166# National Lab. for High Energy Physics, Tsukuba (Japan).
HELAS: HELicity AMPLITUDE SUBROUTINES FOR FEYNMAN DIAGRAM EVALUATIONS
H. Murayama (Tohoku Univ., Sendai, Japan.), I. Watanabe (Hiroshima Univ., Japan.), and K. Hagiwara Jan. 1992 191 p
(DE93-715538; KEK-91-11) Avail: CASI HC A09/MF A02 (US Sales Only)

HELAS is a set of the FORTRAN 77 subroutines which enables us to compute the helicity amplitude of an arbitrary tree level Feynman diagram with a simple sequence of CALL SUBROUTINE statements. It is easy to write down a FORTRAN program to calculate the helicity amplitude of a given process by calling the HELAS subroutines. The example of evaluating the helicity amplitude of the process W(sup +)W(sup -) yields t(anti-t) is shown. The compactness of the helicity amplitude programs is the main advantage of using the HELAS. Another advantage is that it is very easy to allow external heavy particles to decay into light quarks and leptons without losing the spin correlation. The procedure of calculating the cross section of an arbitrary process with the help of the HELAS and noteworthy characteristics of the HELAS system are shown. How to use the HELAS package is explained about the above example. The HELAS subroutines are grouped in wave functions, nine vertices and tools and standard model coupling constants. HELAS CHECK messages makes the job of finding mistakes easy. DOE

N93-31181# Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro.
ON THE DIRAC EQUATION IN THREE DIMENSIONS
C. A. Linhares and J. A. Mignaco 1991 19 p
(DE93-609915; CBPF-NF-035/91) Avail: CASI HC A03/MF A01 (US Sales Only)

We argue that, in three dimensions, spinors should have four components as a consequence of the algebraic structure realized from the Clifford algebra related to the Dirac equation. DOE

N93-31290# Academy of Sciences of the Ukraine, Kiev. Inst. Teoreticheskoj Fiziki.
THREE-NEUTRINO OSCILLATIONS IN MATTER AND TOPOLOGICAL PHASES
V. A. Naumov 1991 24 p In RUSSIAN
(DE93-608386; ITF-91-34) Avail: CASI HC A03/MF A01 (US Sales Only)

Implicit formulas for topological phases gamma(sub N) for system of three mixed Dirac neutrinos, propagating through the matter with arbitrary density and composition distributions, which are not dependent on the parametrization of vacuum mixing matrix V, are derived in the framework of Berry adiabatic approach. It is shown that Berry phases gamma(sub N)(sup B), originating under periodical varying matter parameters, are equal to zero identically, while gamma(sub N) not identical to 0 (at special gauge) for non-cyclic evolution under condition that all matrix elements of V, CP-violating phase, and neutrino mass squares differences m(sub i)(sup 2) - m(sub j)(sup 2) (i not equal to j) are not equal to zero simultaneously. Exact formulas for neutrino mixing matrix in the matter and adiabatic evolution operator are found. The recurrent algorithm for calculation of corrections to adiabatic approximation is given. DOE

N93-31301# International Centre for Theoretical Physics, Trieste (Italy).
INFORMATION-THEORETIC AND WIGNER FUNCTION APPROACHES TO THE NONCLASSICAL STATES DYNAMICS FOR THE VARIABLE FREQUENCY HARMONIC OSCILLATOR
J. Aliaga (Buenos Aires Univ., Argentina.), G. Crespo, and A. N. Proto Sep. 1992 9 p
(DE93-608166; IC-92/239) Avail: CASI HC A02/MF A01 (US Sales Only)

Coherent and squeezed states for the time-dependent frequency harmonic oscillator are analyzed using Maximum Entropy Principle techniques. The information-theoretic procedure leads to results equivalent to that of the Wigner function formalism, although the former gives a physical interpretation of the involved parameters and allows for a non-zero temperature density matrix. DOE

N93-31460# International Centre for Theoretical Physics, Trieste (Italy).
A NOTE ON THE DIRAC CANONICAL QUANTIZATION OF MASSIVE YANG-MILLS THEORY
A. CaboMontesdeOca Sep. 1992 6 p
(DE93-608199; IC-92/241) Avail: CASI HC A02/MF A01 (US Sales Only)

Various implications of the Lorentz constraint are investigated within the Dirac-brackets quantization of massive Yang-Mills theory. It follows that matrix elements of arbitrary products of the divergence operators delta(sub mu)A(sup a)(sub mu) between physical states should vanish. Then, after adding certain functionals to the Hamiltonian, the effect on the physical states of the evolution operator remains unaltered. Arguments are put forward for modified expressions for the formal path integral representation of the evolution operator. DOE

N93-31502# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
ISOCLINY, SOUILLART MATRICES, QUATERNIONS AND FOUR-DIMENSIONAL ROTATIONS
J. E. Mebius 1992 17 p
(Rept-92-57; ETN-93-94249) Copyright Avail: CASI HC A03/MF A01

A proof is given of the theorem that in the framework of the representation of four dimensional real vector space by quaternions, isoclinic rotations of Euclidean four dimensional space about a fixed point are represented by either left-multiplications or right-multiplications by unit quaternions. A connection with the algebra of real four by four matrices is established. ESA

N93-31546# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
MOST MONOTHETIC EXTENSIONS ARE RANK-1
A. Iwanik (Technical Univ. of Wroclaw, Poland.) and J. Serafin 1993 19 p
(Rept-93-05; ETN-93-94300) Copyright Avail: CASI HC A03/MF A01

Let T be an ergodic automorphism of a standard probability space and let G be a compact metrizable monothetic group. The space of all measurable G-cocycles is endowed with the L(sup 1) topology. A proof that if T is sufficiently well approximated by cyclic automorphisms then a generic G-extension is rank-1 is given. Moreover, a generic cocycle is weakly mixing. The counterparts of these results are also given in the case of continuous Anzai cocycles of topological degree zero. ESA

N93-31905# Melbourne Univ., Parkville (Australia). School of Physics.
HAMILTONIAN MOMENTS AND THE LANCZOS METHOD IN THE HEISENBERG MODEL
L. C. L. Hollenberg and C. J. Griffin 1992 17 p
(DE93-609845; UM-P-92/43; OZ-92/13) Avail: CASI HC A03/MF A01 (US Sales Only)

The connected Hamiltonian moments, (H(sup n))(sub c) of the one dimensional s = 1/2 Heisenberg model with respect to the Neel state are calculated up to n = 17. Subsequent calculation of Hamiltonian moments, (H(sup n)) allow the first nine iterations of the Lanczos diagonalization to be calculated analytically for arbitrarily lattice size. DOE

N93-31906# Melbourne Univ., Parkville (Australia). School of Physics.
PLAQUETTE EXPANSION IN LATTICE HAMILTONIAN MODELS

L. C. L. Hollenberg Jul. 1992 16 p
(DE93-609846; UM-P-92/46; OZ-92/18) Avail: CASI HC A03/MF A01 (US Sales Only)

The Lanczos method in operator form is applied to a general lattice Hamiltonian and expressions for the first few Lanczos matrices in terms of the connected Hamiltonian moments, (H(sup n))(sub c), and the number of plaquettes, N(sub p), are obtained. Expansions in 1/N(sub p) suggest a very simple general form for the first few terms in the 1/N(sub p) expansions for all alpha(sub n) and beta(sub n). For the one dimensional Heisenberg spin-chain, it is demonstrated that the ground-state eigenvalue of the tri-diagonal Lanczos matrix derived from this plaquette expansion approaches the true infinite lattice limit as the number of terms in the plaquette expansion is increased. DOE

N93-31910# Universidade Estadual de Paulista, Sao Paulo (Brazil). Instituto de Fisica Teorica.
COMPLEX KOHN VARIATIONAL PRINCIPLE FOR THE SOLUTION OF LIPPMANN-SCHWINGER EQUATIONS
S. K. Adhikari Jul. 1992 15 p
(DE93-609885; IFT-P-028/92) Avail: CASI HC A03/MF A01 (US Sales Only)

A recently proposed version of the Kohn variational principle for the t matrix incorporating the correct boundary condition is applied for the first time to the study of nucleon-nucleon scattering. Analytic expressions can be obtained for all the integrals in the method for a wide class of potentials and for a suitable choice of trial functions. Closed-form analytic expressions for these integrals are given for Yakawa and exponential potentials. Calculations with two commonly used S-wave nucleon-nucleon potentials show that the method may converge faster than other solution schemes not only for the phase-shifts but also for the off-shell t matrix elements if the freedom in the choice of the trial function is exploited. DOE

N93-32412# Academy of Sciences of the Ukraine, Kiev. Inst. Teoreticheskoj Fiziki.
DIFFERENTIAL EQUATIONS METHOD: THE CALCULATION OF N (N GREATER THAN 2)-POINTS DIAGRAMS
A. V. Kotikov 1991 12 p
(DE93-609887; ITP-91-26) Avail: CASI HC A03/MF A01 (US Sales Only)

The earlier invented method of massive Feynman diagrams calculation, namely, the differential equations method, was expanded to N-point diagrams. A simple algorithm which allows us to reduce the vertex-type diagram to the propagator-type diagrams, the box-type diagram to the vertex-type diagrams and, in general, the N-point diagram to the (N-1)-point diagrams was obtained. It was shown that this method provides a simple procedure of evaluating the result without D-space integrals (for the dimensional regularization) calculation. DOE

N93-31441*# Togai InfraLogic, Inc., Irvine, CA.
COMMERCIAL APPLICATIONS
Masaki Togai *In* McDonnell-Douglas Space Systems Co., Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 29-64 (For primary document see N93-31439 12-18)
Avail: CASI HC A03/MF A04

N93-31442*# Tokyo Inst. of Tech. (Japan).
CURRENT PROJECTS IN FUZZY CONTROL
Michio Sugeno *In* McDonnell-Douglas Space Systems Co., Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 65-77 (For primary document see N93-31439 12-18)
Avail: CASI HC A03/MF A04

N93-31443*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
TERMINOLOGY AND CONCEPTS OF CONTROL AND FUZZY LOGIC
Jack Aldridge (McDonnell-Douglas Space Systems Co., Houston, TX.), Robert Lea, Yashvant Jani (LinCom Corp., Houston, TX.), and Jonathan Weiss (McDonnell-Douglas Space Systems Co., Houston, TX.) *In* McDonnell-Douglas Space Systems Co., Workshop on Fuzzy Control Systems and Space Station Applications 79-98 (SEE N93-31439 12-18) Nov. 1990 (For primary document see N93-31439 12-18)
Avail: CASI HC A03/MF A04

N93-31445*# APT, Inc., San Diego, CA.
OVERVIEW OF FUZZY LOGIC
Xiwen Ma *In* McDonnell-Douglas Space Systems Co., Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 109-126 (For primary document see N93-31439 12-18)
Avail: CASI HC A03/MF A04

N93-31446*# University of Southern California, Los Angeles.
INTRODUCTION TO FUZZY SET THEORY
Bart Kosko *In* McDonnell-Douglas Space Systems Co., Workshop on Fuzzy Control Systems and Space Station Applications Nov. 1990 p 127-320 (For primary document see N93-31439 12-18)
Avail: CASI HC A09/MF A04

70 PHYSICS (GENERAL)

For precision time and time interval (PTTI) see *35 Instrumentation and Photography;* for geophysics, astrophysics or solar physics see *46 Geophysics, 90 Astrophysics,* or *92 Solar Physics.*

N93-31088# Academy of Sciences (USSR), Novosibirsk. Inst. Yadernoj Fiziki.
LOW APERTURE MAGNETIC ELEMENTS MEASUREMENTS
V. A. Aleksandrov, A. A. Mikhajlichenko, V. V. Parkhomchuk, A. A. Seryj, and V. D. Shiltsev 1991 11 p
(DE93-605897; IYaF-91-70) Avail: CASI HC A03/MF A01 (US Sales Only)

Two new methods of magnetic field measurements in low aperture elements are discussed. The first method uses thin magnetoresistive bismuth wire and the second uses strained wire with AC. Principles of measuring used in the last technique are different from well known SLAC method of vibrating wire. Results of testing 0.38 T/mm quadrupole and VLEPP final focus test 3 T/mm lens are presented. Brief comparing of the lens axis determination precision of these methods is also discussed. DOE

N93-31633# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
RESONANCE AND NEAR-RESONANCE FOR A NONLINEAR WAVE EQUATION
C. J. Blom and S. A. Vavilov (Leningrad Inst. of Precision Mechanics and Optics, USSR.) 1992 36 p Sponsored in part by Netherlands Organization for Scientific Technology, and SMC
(Rept-92-92; ETN-93-94281) Copyright Avail: CASI HC A03/MF A01

The existence and approximation of T time periodic solutions, with T = 2pi or T near 2pi to a given boundary value problem are studied. The main tools used are a method of comparison, the theory of Lyapunov Majorants and the (topological) degree theory. It is proved that a solution exists for a sufficiently small or a sufficiently large external force g(t,x). From the results it follows that solutions obtained for sufficiently small external forces can not be extended continuously to solutions to the problem with large external forcing without being disrupted in their existence. In the examples some uncharacteristic resonance properties of some solutions are presented. It is shown in the examples that for not too large external forces the solution need not be unique. ESA

N93-31651 Texas Univ., Austin.
TEMPORAL AND SPATIAL ANALYSIS IN KNOWLEDGE-BASED PHYSICS PROBLEM-SOLVING Ph.D. Thesis
Xiang-Seng Lee 1992 281 p
Avail: Univ. Microfilms Order No. DA9309217

Physics problems as stated in textbooks are typically informal and incomplete, and not amenable to the direct application of the general laws of physics. A theory of analysis for automatically solving such problems is presented. In particular, the theory provides a detailed methodology for constructing a formal problem representation, called physical representation, upon which physics laws may be appropriately selected and instantiated. With the equations generated by these laws, the solutions to these problems are obtained through strictly mathematical manipulations. This theory provides a well-structured domain language, in which it is relatively easy to state mechanical knowledge and mechanics problems. In the language the notion of basic physical phenomenon for representing the knowledge of

physical situations and events is introduced. This notion serves as both the building block for the physical representation and as a vehicle for accessing the appropriate physical laws. Both basic physical phenomena and more traditional temporal entities, instants, and intervals may be used as time references. This dual-system representation facilitates bi-level abstractions of time necessary to avoid discontinuities introduced by short impulsive phenomena, e.g., collisions, and corresponds well with human-like temporal reasoning. The language also includes an ontology of space, using multiple abstractions to account for its inherent complexity, and representation schemes for physical laws and equations. The other key ingredient of the theory is a repertoire of ordered knowledge sources, formulated to specify the derivation procedures of a physical representation. The domain language, in which these knowledge sources are written, has a structure which is useful as a theoretical basis for determining their ordering and inference step sizes. This practice has proven crucial for building knowledge-based systems that are easy to debug and modify. The theory was implemented and tested in a computer program which has successfully solved several relatively difficult problems selected from a widely used textbook. Methods implemented in the program for intelligently selecting appropriate physics laws and for solving equations are also discussed. Dissert. Abstr.

N93-31653# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
ON THE DYNAMICS OF AEROELASTIC OSCILLATORS WITH ONE DEGREE OF FREEDOM
T. I. Haaker and A. H. P. vanderBurgh 1992 26 p
(Rept-92-96; ETN-93-94285) Copyright Avail: CASI HC A03/MF A01

Two aeroelastic oscillators in crossflow with one degree of freedom are considered. The first oscillator is a special mass-spring system which is able to oscillate in crossflow, that is perpendicular to the direction of a one dimensional uniform flowing medium. The second oscillator is a seesaw type oscillator in crossflow. The geometry of the oscillators is such that for both oscillators an axis of symmetry can be defined. The interesting difference between the two oscillators is the difference between the dynamical behavior of this axis. For the first oscillator the slope of the axis of symmetry with the horizontal plane does not change with time, whereas for the seesaw type oscillator this slope is time dependent. By using a quasi steady theory as model equations a Lienard and a generalized Lienard equation are obtained. For the first equation a global and for the second equation a local analysis is presented resulting in conditions for the existence and uniqueness of limit cycles. ESA

N93-31806# International Centre for Theoretical Physics, Trieste (Italy).
NONCLASSICAL DISORDERED PHASE IN THE STRONG QUANTUM LIMIT OF FRUSTRATED ANTIFERROMAGNETS
H. A. Ceccatto (Instituto de Fisica Rosario, Argentina.), C. J. Gazza (Instituto de Fisica Rosario, Argentina.), and A. E. Trumper (Instituto de Fisica Rosario, Argentina.) Jul. 1992 10 p
(DE92-645691; IC-92/136) Avail: CASI HC A02/MF A01 (US Sales Only)

The Schwinger boson approach to quantum helimagnets is discussed. It is shown that in order to get quantitative agreement with exact results on finite lattices, parity-breaking pairing of bosons must be allowed. The so-called J(sub 1) - J(sub 2) - J(sub 3) model is studied, particularly on the special line J(sub 2) = 2J(sub 3). A quantum disordered phase is found between the Neel and spiral phases, though notably only in the strong quantum limit S = 1/2, and for the third-neighbor coupling J(sub 3) is greater than or equal to 0.038 J(sub 1). For spins S is greater than or equal to 1 the spiral phase goes continuously to an antiferromagnetic order. DOE

N93-32291# Delaware Univ., Newark. Dept. of Physics and Astronomy.
FUNDAMENTAL STUDIES OF NEW HIGH-ENERGY PERMANENT MAGNET MATERIALS
G. C. Hadjipanayis 1993 4 p
(Contract DE-FG02-90ER-45413)
(DE93-014707; DOE/ER-45413/3) Avail: CASI HC A01/MF A01

Rare-earth transition metal nitrides and carbides have been prepared by gas-solid reaction with N and HC gases. Neutron diffraction was used to study changes in structure which accompany the nitridation. In NdFe10Mo2N(x), nitrogen occupies the base center site (1/2, 1/2, 0) of the tetragonal unit cell with 84% occupancy. Two crystal structure types were found in LaFe(13-x)Si(x); nitridation of the cubic phase expanded the unit cell by 6.2-10.8% leading to increases in Curie temperature and spontaneous magnetization. The interstitial N atom from nitridation expanded the unit cell volume of NdFe10Mo2 by 3%; the Curie temperature reached 563 K. Magnetically hard NdFeMoN(x) with coercivity 8.8 kOe at RT and 33.7 kOe at 10 K were obtained by nitriding melt-spun ribbons. DOE

N93-32410# Melbourne Univ., Parkville (Australia). School of Physics.
PROPOSAL FOR AN ABSOLUTE, ATOMIC DEFINITION OF MASS
J. W. G. Wignall Nov. 1991 11 p
(DE93-609842; UM-P-91/26) Avail: CASI HC A03/MF A01 (US Sales Only)

It is proposed that the mass of a particle be defined absolutely as its de Broglie frequency, measured as the mean de Broglie wavelength of the particle when it has a mean speed (v) and Lorentz factor (gamma); the masses of systems too large to have a measurable de Broglie wavelength mean are then to be derived by specifying the usual inertial and additive properties of mass. This definition avoids the use of an arbitrary macroscopic standard such as the prototype kilogram, and, if present theory is correct, does not even require the choice of a specific particle as a mass standard. Suggestions are made as to how this absolute mass can be realized and measured at the macroscopic level and, finally, some comments are made on the effect of the new definition on the form of the equations of physics. DOE

71 ACOUSTICS

Includes sound generation, transmission and attenuation.
For noise pollution see *45 Environmental Pollution.*

N93-31051# Aeronautical Research Inst. of Sweden, Stockholm.
MODAL MEASUREMENTS AND PROPELLER FIELD EXCITATION ON ACOUSTIC FULL SCALE MOCKUP OF SAAB 340 AIRCRAFT
Lars Gustavsson Jun. 1992 293 p Sponsored by Swedish National Board for Industrial and Technical Development
(FFA-TN-1992-08; ETN-93-94213) Avail: CASI HC A13/MF A03

The acoustic mockup of the cabin SAAB 340 aircraft was measured in an anechoic chamber concerning modal parameters and operating deflection shapes. The mockup was excited with vibration shakers at the fuselage for modal estimation and with a ring of loudspeakers around the fuselage to generate propeller fields for operating deflection shapes. Two cases of structure configuration were used at the measurements; one consisting of only the fuselage, without trimpanels and floorpanels and one case with trimpanels and floorpanels. Modal measurements were done with excitation on a frame of the fuselage at the propeller plane. The modes were estimated for the individual components; fuselage, trimpanels, floorpanels, and soundfield in the cabin. The modes of the fuselage were compared with the acoustic models in the cabin concerning possible coupling effects. With the loudspeakering, the sound field from the left and the right propeller were generated at a blade passage frequency of 81.9 Hz and its first harmonic. Operating deflection shapes of fuselage, panels, and cabin acoustic were estimated. The results from the measurements could be used to verify a finite element model and as a tool for developing acoustic noise control systems. ESA

N93-31599# Loughborough Univ. of Technology (England). Dept. of Mathematical Sciences.
A FIRST APPROXIMATION TO THE EFFECTS OF MEAN FLOW ON SOUND PROPAGATION THROUGH CYLINDRICAL CAPILLARY TUBES
K. S. Peat Dec. 1992 25 p
(MATHS-Rept-A-181; ETN-93-94037) Avail: CASI HC A03/MF A01

The propagation of sound waves in cylindrical tubes and in the presence of steady flow convection is investigated. The study is motivated by the increasing use of catalytic converters in automatic silencers which have a significant influence on the acoustic characteristics of the complete silencer system. It is shown, with reference to assumed isentropic disturbances, that radial velocity terms have negligible influence upon the axial wave propagation in capillary tubes. A variational solution to the problem of nonisentropic wave propagation in a cylindrical tube in the presence of a convecting steady flow is presented. The manner in which the flow influences

the attenuation and the phase velocity in the forward and backward propagating acoustic waves is deduced. It is also shown that a third wave of hydrodynamic type is generated when steady flow is present. ESA

N93-31865# Technical Research Centre of Finland, Espoo. Road, Traffic and Geotechnical Lab.

ACOUSTIC LOGGING FOR STRUCTURAL AND HYDROGEOLOGICAL BEDROCK INVESTIGATIONS [AKUSTINEN LUOTAUS KALLION RAKENNETUTKIMUKSISSA]

Olli Okko and Pertti Hassinen Jul. 1992 72 p In FINNISH Sponsored by Kauppa-ja Teollisuusministerio, Helsinki, Finland

(VTT-JULK-762; ISBN-9-51-384110-3; ETN-93-94018) Copyright Avail: CASI HC A04/MF A01

Full waveform sonic logs were obtained from 56 mm diameter holes drilled in granitic precambrian bedrock. The ability of tomographical inversion techniques of the long spaced sonic tool in the analysis of the acoustic velocities and of the damping factors in the formation is discussed. The engineering properties of rock can be defined, in principle, by the density and by the velocity of compressional and shear waves. The digitally recorded full waveforms contain the velocity information. Because the S arrival is very sensitive to single cracks, the profiles representing mechanical properties of the formation are based on a constant Poisson ratio and the P wave velocity curve. Two significant features in the logs are the lack of proper tube waves and an increase in the P wave velocity within the uppermost 20 m representing the increase of the shear strength in the test hole. In this case history the shear and tube wave windows are examined for amplitude content which is also applied toward the hydraulic characterization of fractures as open and possible flowing or closed and nonflowing. ESA

N93-31868*# Institute for Computer Applications in Science and Engineering, Hampton, VA.

AN EFFICIENT MODEL FOR COUPLING STRUCTURAL VIBRATIONS WITH ACOUSTIC RADIATION Final Report

Abdelkader Frendi (Analytical Services and Materials, Inc., Hampton, VA.), Lucio Maestrello (National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.), and Lu Ting Washington Apr. 1993 27 p Submitted for publication

(Contracts NAS1-19480; NAS1-18605; RTOP 505-90-52-01)

(NASA-CR-191452; NAS 1.26:191452; ICASE-93-18) Avail: CASI HC A03/MF A01

The scattering of an incident wave by a flexible panel is studied. The panel vibration is governed by the nonlinear plate equations while the loading on the panel, which is the pressure difference across the panel, depends on the reflected and transmitted waves. Two models are used to calculate this structural-acoustic interaction problem. One solves the three dimensional nonlinear Euler equations for the flow-field coupled with the plate equations (the fully coupled model). The second uses the linear wave equation for the acoustic field and expresses the load as a double integral involving the panel oscillation (the decoupled model). The panel oscillation governed by a system of integro-differential equations is solved numerically and the acoustic field is then defined by an explicit formula. Numerical results are obtained using the two models for linear and nonlinear panel vibrations. The predictions given by these two models are in good agreement but the computational time needed for the 'fully coupled model' is 60 times longer than that for 'the decoupled model'. Author (revised)

N93-32221*# University of Southern California, Los Angeles. Dept. of Aerospace Engineering.

CONTROL OF JET NOISE Final Report, 1 Feb. 1991 - 31 Jan. 1992

Stefan Schreck 1992 6 p

(Grant NAG1-1096)

(NASA-CR-193552; NAS 1.26:193552) Avail: CASI HC A02/MF A01

To investigate the possibility of active control of jet noise, knowledge of the noise generation mechanisms in natural jets is essential. Once these mechanisms are determined, active control can be used to manipulate the noise production processes. We investigated the evolution of the flow fields and the acoustic fields of rectangular and circular jets. A predominant flapping mode was found in the supersonic rectangular jets. We hope to increase the spreading of supersonic jets by active control of the flapping mode found in rectangular supersonic jets. Author (revised)

N93-32238*# Arizona State Univ., Tempe.

EFFECT OF SOUND ON BOUNDARY LAYER STABILITY Final Report

William S. Saric and Shelly Anne Spencer Jun. 1993 102 p

(Contract NCC2-659)

(NASA-CR-193367; NAS 1.26:193367) Avail: CASI HC A06/MF A02

Experiments are conducted in the Arizona State University Unsteady Wind Tunnel with a zero-pressure-gradient flat-plate model that has a 67:1 elliptical leading edge. Boundary-layer measurements are made of the streamwise fluctuating-velocity component in order to identify the amplified T-S waves that are forced by downstream-traveling sound waves. Measurements are taken with circular 3-D roughness elements placed at the Branch 1 neutral stability point for the frequency under consideration, and then with the roughness element downstream of Branch 1. These roughness elements have a principal chord dimension equal to 2 lambda(sub TS)/pi of the T-S waves under study and are 'stacked' in order to resemble a Gaussian height distribution. Measurements taken just downstream of the roughness (with leading-edge T-S waves, surface roughness T-S waves, instrumentation sting vibrations, and the Stokes wave subtracted) show the generation of 3-D T-S waves, but not in the characteristic heart-shaped disturbance field predicted by 3-D asymptotic theory. Maximum disturbance amplitudes are found on the roughness centerline. However, some near-field characteristics predicted by numerical modeling are observed. Author

N93-32301# Sandia National Labs., Livermore, CA.

DYNAMIC RESPONSE OF A TRANSDUCER MOUNTED AT ONE END OF AN ACOUSTICAL CAVITY

G. A. Benedetti Apr. 1993 67 p

(Contract DE-AC04-76DR-00789)

(DE93-012837; SAND-92-8003) Avail: CASI HC A04/MF A01

The dynamic response of a transducer mounted at one end of a one-dimensional acoustical cavity is determined. The cavity is filled with a compressible isentropic fluid, and the fluid at the open end of the cavity (i.e., the boundary at $x = 0$) is subjected to an axial displacement specified with respect to time. At the other end of the cavity the transducer is represented as a mass, spring, and damper system. Consequently, the boundary condition at $x = 1$ is also time dependent. The general solution to the boundary value problem is obtained as well as the steady state solution for harmonic excitation. Since the steady state response for harmonic excitation is of particular interest, an analytical or closed form solution is obtained for the displacement and pressure response functions. In addition, a simple and useful algebraic expression is obtained for the steady state pressure-frequency response function for harmonic excitation. An approximate solution is also obtained for the dynamic response of a transducer mounted at one end of a two-diameter or stepped-recessed cavity. Stepped-recessed pressure transducer cavities, which may be grease-filled, are suitable for measuring quasi-static pressures in solid propellant guns and regenerative liquid propellant guns (RLPGs), provided the frequencies contained in the quasi-static pressure pulse are low relative to the fundamental frequency for the empty stepped cavity. DOE

N93-32316# Army Research Lab., White Sands Missle Range, NM.

AN ACOUSTIC SCATTERING CODE Final Report

Jose Lopez (Texas Univ., El Paso.), G. H. Goedecke (New Mexico State Univ., Las Cruces.), and Harry J. Auvermann Apr. 1993 50 p

(AD-A265863; ARL-TR-53) Avail: CASI HC A03/MF A01

Acoustical scattering from atmospheric turbulence is of interest to the Army because it has been identified as a candidate cause of higher than expected sound levels in shadow zones. Shadow zones are those regions where ray theory indicates no sound penetrates. Scattering into these zones may give non-line-of-sight detection through acoustic detection. This report documents the creation of a computer code for acoustic scattering from a collection of turbules or eddies. The picture is a collection of turbules of different sizes with a specified number density in each size increment. In this aspect, the picture is similar to that of optical scattering from atmospheric aerosols where there is a collection of particles of different sizes with a specified size distribution. The optical scattering code AGAUS is the starting point for creation of the acoustic scattering from turbules (ASCT) code, which will accomplish for acoustic scattering what AGAUS accomplishes for optical scattering. The similarities and differences between the two types of scattering are pointed out as they influence the computational algorithm. DTIC

N93-32317# George Mason Univ., Fairfax, VA.
EXPERIMENTS ON A GENERAL THERMOACOUSTIC ENGINE Final Report, 15 Jul. 1989 - 14 Jul. 1992
Peter H. Ceperley 7 Jun. 1993 18 p
(Contract N00014-89-J-3104)
(AD-A265864; PHC-001) Avail: CASI HC A03/MF A01

Research on thermoacoustic devices has been carried out during the 36 month period ending 14 July, 1992. In the area of general thermoacoustics: (1) Several different setups were constructed to apply arbitrary sound fields to thermoacoustic structures. (2) Detailed computer modeling of the effect of varying the phase of the acoustic impedance of the sound field has been carried out. (3) A simple equivalent thermodynamic circuit model has been developed and computer tested. (4) These setups were used to measure thermoacoustic properties of various grades of steel wool, filter sand, layered stainless steel, and layered mylar. In the area of acoustic resonators: several rotating wave acoustic resonators were built and tested as means to efficiently apply an arbitrary phased sound field to a thermoacoustic device. Single point excitation of these was achieved. Experiments on an arbitrary phased cryocooler were made. DTIC

N93-32339 Institute of Sound and Vibration Research, Southampton (England). Fluid Dynamics and Acoustics Group.
THE PREDICTION OF NOISE FROM CO-AXIAL JETS
M. J. Fisher and G. A. Preston Mar. 1993 60 p
(ISVR-TR-215) Copyright Avail: Issuing Activity (Institute of Sound and Vibration Research, University of Southampton, Southampton SO9 5NH, England)

A portion of an on-going fundamental study of co-axial jet noise both statically and in flight is reported. Three principal noise producing regions are identified and their mean flow and turbulence characteristics classified from published data. The noise production from each region is then calculated using single jet prediction methods for flows of similar mean velocity and turbulence profiles. The initial test of this prediction scheme was conducted by comparison with data from a cold, co-planar co-axial jet configuration. Agreement, in terms of 1/3 octave spectral prediction, is significantly better than 1 dB over a wide range of both angle of observation and velocity ratio. Author (revised)

N93-32377 Civil Aviation Authority, London (England). Directorate of Operational Research and Analysis.
REACTION TO AIRCRAFT NOISE NEAR GENERAL AVIATION AIRFIELDS
Jun. 1992 95 p
(DORA-8203; ETN-93-93933) Copyright Avail: Issuing Activity (Civil Aviation Authority, Greville House, 37 Gratton Road, Cheltenham, England, HC)

The results of a social survey and noise measurement program around five United Kingdom General Aviation (GA) airfields at Coventry, Kidlington, Leavesden, Shoreham, and Staverton are presented. The fieldwork was carried out during the Summer and early Autumn of 1981. The aims of the study were as follows: to establish the nature and scale of disturbance through noise from GA operations at a number of representative GA airfields; to determine how adequate existing noise indices, in particular NNI (Noise and Number Index) and Leq, (measure of sound energy experienced during a specified period), are in describing disturbance due to GA operations, and what modification, if any, might be necessary to make them appropriate. The NNI is found to show a reasonable correlation with disturbance around the airfields. Reaction above 35 NNI appears stronger than for public transport operations at major airports. ESA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure, electron properties, and molecular spectra.

N93-31059# Academy of Sciences of the Ukraine, Kiev. Inst. Teoreticheskoj Fiziki.
PION MULTIPLICITY AS A PROBE OF THE DECONFINEMENT TRANSITION IN HEAVY-ION COLLISIONS
M. I. Gorenstejn, Shin Nan Yang, and Che Ming Ko 1991 8 p
(DE93-608484; ITP-91-82) Avail: CASI HC A02/MF A01 (US Sales Only)

The hydrochemical model is used to calculate the pion multiplicity in relativistic heavy-ion collisions. Chemical reactions are explicitly taken into account in the expansion stage of the hadronic phase. It leads to the absence of chemical equilibrium among hadronic particles and a nonzero value of the pion chemical potential at thermal freeze out. We find a specific structure in the incident energy dependence of the pion multiplicity as a result of the formation of the quark-hadron mixed phase in the initial stage of the collision. DOE

N93-31063# Florida Univ., Gainesville.
METASTABILITY IN MOLECULES Final Report, 1989 - 1992
Rodney J. Bartlett 5 Mar. 1993 24 p
(Grant AF-AFOSR-0207-89)
(AD-A264344; AFOSR-93-0250TR) Avail: CASI HC A03/MF A01

Pentazole (HN5) has the fingerprints of a metastable molecule since even though it offers a perfectly logical, even aromatic electronic structure, it is unknown experimentally. We subjected HN5 to theoretical analysis. At the correlated level we find that for the reaction, 2HN5 - 5N2 + H2, Delta(E) is -129.1 kcal/mol resulting in an I(sub sp) of 346 as a monopropellant. Considering that derivatives of the basic structure should be made to stabilize the pentazole ring, we can consider some which will be quite energetic (examples include nitropentazole, and a bipentazole analogous to biphenyl and possibly a dinitramine pentazole (O2N)N-N5, and numerous metal, MN5 structures, where M could be Li). The prospect for actually making and using pentazoles is promising. Several recent methodology developments have been accomplished in this project. These methods, mostly unique to our effort, make it possible to perform high-level, accurate correlated calculations on much larger potential metastable species than was previously possible. These include the following: (1) Direct product decomposition approach to the full use of Abelian symmetry in coupled-cluster and MBPT applications; (2) Restricted open-shell Hartree Fock (ROHF) based CC and MBPT methods; and (3) Analytical first derivatives (i.e. gradient) for open-shell CC/MBPT methods. DTIC

N93-31099# International Centre for Theoretical Physics, Trieste (Italy).
NONLINEAR RESPONSE FUNCTION FOR TWO-PHONON POLARITONS
K. T. Stoychev Sep. 1992 15 p
(DE93-608692; IC-92/251) Avail: CASI HC A03/MF A01 (US Sales Only)

A nonlinear response function describing three-polariton processes (two single-phonon polaritons and a two-phonon polariton) is derived for a system of interaction phonons and photons. The main features of the nonlinear optical spectra in the two-phonon polariton region are analyzed. DOE

N93-31149# Groningen Rijksuniv. (Netherlands). Kernfysisch Versneller Inst.
COVARIANT DESCRIPTION OF THE DELTA IN NUCLEAR MATTER
Fred deJong and Rudi Mafliet 1992 26 p Submitted for publication
(KVI-951; ETN-93-94082) Avail: CASI HC A03/MF A01

To incorporate the delta isobar in the relativistic Dirac-Brueckner model, a formalism that treats the delta analogously to the nucleon is developed. Scalar and vector components of the delta self energy and effective quantities for the delta similar to the ones for the nucleon are introduced. Using the formalism and based on one boson exchange interactions, a parameter free calculation of the equation of state of nuclear matter is presented. The results for the effective quantities of both the nucleon and the delta are listed. The main result is, that in the model the properties of the nucleon in nuclear matter seem hardly affected by the inclusion of the delta. The medium dependence of the properties of the delta turns out to be quite small. The momentum dependence of the mean field of the delta is investigated. ESA

N93-31154 Colorado State Univ., Fort Collins.
SCATTERING BY IRREGULAR PARTICLES IN ANOMALOUS DIFFRACTION AND DISCRETE DIPOLE APPROXIMATIONS Ph.D. Thesis
Piotr Jacek Flatau 1992 146 p
Avail: Univ. Microfilms Order No. DA9311374

The effects of irregular particles on scattering of radiation are considered

using theoretical methods. Major motivation for studying scattering by irregular particles is presented on the basis of results from a simple climate model. These results indicate that uncertainties in our knowledge of the asymmetry parameter and extinction factors significantly affect the response of this model to an imposed climate change. The discrete dipole approximation (DDA) is considerably extended in this study. It is shown that this is a robust method as it includes boundary conditions in its formulation, is numerically stable, and is computationally fast. The method is validated against exact results. DDA is then applied to study scattering by particle shapes typical of ice crystal clouds. Parametrization of scattering properties of irregular particles is considered on the basis of the anomalous diffraction theory. The new approach to the ADT is introduced based on a ray tracing and compared to DDA for selected geometries. We develop the ADT for particles distributed in size. A key result is that the similarity scaling predicted by the ADT for spheres is also shown to apply for nonspherical particles. The results represent a complete parameterization of the three main optical properties: the volume extinction, the single scattering albedo, and the particle asymmetry parameter, as a function of refractive index, characteristic radius of the distribution and the distribution width. Dissert. Abstr.

N93-31167# National Lab. for High Energy Physics, Tsukuba (Japan).
KDP 903
S. Ikeda, ed. Apr. 1992 86 p Presented at the KENS Workshop on Hydrogen-Bonded Matters, Tsukuba, Japan, 21-22 Jan. 1992
(DE93-715539; KEK-PROC-92-3; CONF-9201117) Avail: CASI HC A05/MF A01 (US Sales Only)

The behavior of hydrogen has brought about large influence to the livelihood and life activities of mankind. Of the behavior of hydrogen, the behavior related to hydrogen bond is most important, and most attractive for researchers, because there is water combined with the living of mankind. The workshop on hydrogen bond type substances was held in 1990 as the KENS workshop, and this is the third workshop. The workshop is to explore the role and mechanism of hydrogen bond in various hydrogen bond type substances, and to extract the general properties of hydrogen bond. This time, it particularly aimed at the discussion by paying attention to the move of hydrogen in hydrogen bond type substances, and the interaction of hydrogen with electrons. The substances presented at the workshop were diverse, but it seems that the common understanding and the policy for hereafter about the hydrogen bond were obtained. The hydrogen bond can be explained only by the cooperation of three factors: the move of hydrogen, the effect of surrounding atom group, and the effect of the electrons around hydrogen. DOE

N93-31201# National Inst. of Standards and Technology, Gaithersburg, MD. Physics Lab.
ENDF/B-6 NEUTRON CROSS SECTION MEASUREMENT STANDARDS
A. D. Carlson, W. P. Poenitz (Argonne National Lab., IL.), G. M. Hale (Los Alamos National Lab., NM.), R. W. Peelle (Oak Ridge National Lab., TN.), and D. C. Dodder (Los Alamos National Lab., NM.) May 1993 109 p See also PB86-229713 and PB92-159128
(PB93-189868; NISTIR-5177) Avail: CASI HC A06/MF A02

The document provides information on the neutron cross section standards placed in the ENDF/B-VI library. The H(n,n), (3)He(n,p), and C(n,n) cross sections were each obtained from well established R-matrix analysis techniques. The additional standards, i.e., the (6)Li(n,t), (10)B(n,alpha 1), Au(n,gamma), and (235)U(n,f) cross sections were obtained with a new method. The new method involves combining the results of a simultaneous evaluation and R-matrix analyses. Contained herein is a discussion of the development of the method, a description of the evaluation process, some information on the various experiments used in the analyses, comparisons of the R-matrix, simultaneous evaluation and combination results, and comparisons to ENDF/B-V. Tables of numerical data are given for each of the cross section standards. Also, the new ENDF/B-VI evaluation for the spontaneous fission neutron spectrum for (252)Cf is given. NTIS

N93-31228# Melbourne Univ., Parkville (Australia). School of Physics.
AN ELECTROSTATIC MIRROR FOR NEUTRAL POLAR MOLECULES
S. J. Wark and G. I. Opat 1992 31 p
(DE93-609405; UM-P-91/97) Avail: CASI HC A03/MF A01 (US Sales Only)

An electrostatic mirror for neutral polar molecules was constructed using an array of electrodes of alternating polarity between which a high potential was applied. This configuration produces an exponentially evanescing electric field that interacts with polar molecules by the Stark effect. The spatial gradients of the Stark energies produce forces which were used to reflect a pulsed beam of chloromethane (CH3Cl) molecules with a reflectivity of 25% at grazing angles of incidence of around 5 mrad. Reflections were also produced with applied voltages as low as 100 V or with grazing angles greater than 20 mrad. This type of device could be useful for the manipulation of slow molecular beams and would permit the construction of optical elements for the de Broglie waves of molecules. DOE

N93-31239# Weizmann Inst. of Science, Rehovoth (Israel).
MONTE-CARLO SIMULATIONS OF SECONDARY ELECTRON EMISSION FROM CsI, INDUCED BY 1-10 keV X RAYS AND ELECTRONS
A. Akkerman, A. Gibrekhterman, A. Breskin, and R. Chechik May 1992 19 p
(DE93-604906; WIS-PH-92-28) Avail: CASI HC A03/MF A01 (US Sales Only)

A model for electron transport and emission in CsI is proposed. It is based on theoretically calculated microscopic cross-sections for electron interaction with the nuclear and the electronic components of the solid. A Monte Carlo program based on this model was developed to simulate secondary electron emission induced by x-rays and electrons in the energy range of 1 to 10 keV. The calculated secondary emission yields agree with existing experimental data. The model provides all necessary characteristics for the design of radiation detectors based on secondary electron emission. It can be expanded to higher incident energies and other alkali halides. DOE

N93-31240# Academy of Sciences of the Ukraine, Kiev. Inst. Teoreticheskoj Fiziki.
NON-STANDARD REPRESENTATIONS OF THE SPACE-TIME GROUPS AND THEIR APPLICATIONS TO THE DYNAMICAL THEORY OF ELEMENTARY PARTICLES
S. S. Sannikov 1991 29 p In RUSSIAN
(DE93-608203; ITF-91-72) Avail: CASI HC A03/MF A01 (US Sales Only)

A new dynamical approach to the elementary particles problem is proposed. Mathematical foundations of such an approach (non-unitary quantum theory) are developed. Investigation of the structure of the space-time and Dirac vibration in the region of very small distances forms the basis of our considerations. DOE

N93-31241# Academy of Sciences of the Ukraine, Kiev. Inst. Teoreticheskoj Fiziki.
NONLINEAR POMERON AND ODDERON IN ELASTIC RE-SCATTERINGS
S. V. Akkelin and E. S. Martynov 1991 13 p
(DE93-608326; ITP-91-100) Avail: CASI HC A03/MF A01 (US Sales Only)

A supercritical and dipole models of the elastic scattering with nonlinear trajectories of bare Pomeron and Odderon are considered. The unitary constraints on the parameters of the Odderon trajectory are obtained. The multiple Pomeron-Odderon cuts are calculated. Their contribution to the elastic amplitudes are shown to reproduce qualitatively the result obtained previously for the linear Pomeron and Odderon. The essential difference in the crossing-odd properties of supercritical and dipole models is noted. DOE

N93-31242# Academy of Sciences of the Ukraine, Kiev. Inst. Teoreticheskoj Fiziki.
SUPERCRITICAL POMERON AND SPIN EFFECTS IN MESON-NUCLEON SCATTERING AT HIGH ENERGY
S. V. Akkelin 1991 9 p
(DE93-608327; ITP-91-34) Avail: CASI HC A02/MF A01 (US Sales Only)

Helicity amplitudes of elastic (pi)N-scattering and charge-exchange scattering in a supercritical pomeron model are calculated. It is shown that the polarization of elastic (pi)N-scattering at fixed transferred momentum decreases as approximately 1/lns and the charge-exchange scattering oscillates and tends to a constant with the increasing transferred momentum. DOE

N93-31243# Academy of Sciences of the Ukraine, Kiev. Inst. Teoreticheskoj Fiziki.
ODDERON DOMINANCE IN DIPOLE MODEL OF HADRON ELASTIC SCATTERING
E. S. Martynov 1991 8 p
(DE93-608329; ITP-91-99) Avail: CASI HC A02/MF A01 (US Sales Only)

The contribution of the multiple Pomeron-Odderon cuts in elastic pp and (p-bar)p scattering amplitudes at fixed transferred momenta is calculated. It is shown that the asymptotic behavior of the pp- and (p-bar)p- amplitudes is controlled by the parameters of the input Odderon rather than Pomeron, if the slope of Pomeron trajectory is larger than the slope of Odderon trajectory. DOE

N93-31244# Instituto de Engenharia Nuclear, Rio de Janeiro (Brazil).
MOLECULAR DYNAMICAL AND STRUCTURAL STUDIES FOR THE BAKELITE BY NEUTRON CROSS SECTION MEASUREMENTS
D. L. Voi May 1992 55 p
(DE93-609444; IEN-36/92) Avail: CASI HC A04/MF A01 (US Sales Only)

Neutron reaction cross sections were determined by transmission and scattering measurements, to study the dynamics and molecular structure of calcined bakelites. Total cross sections were determined, with a deviation smaller than 5%, from the literature values, by neutron transmission method and a specially devised approximation. These cross sections were then correlated with data obtained with infrared spectroscopy, elemental analysis, and other techniques to get the probable molecular formula of bakelite. Double differential scattering cross sections, scattering law values, and frequency distributions were determined with 15% error using the neutron inelastic scattering method. The frequency distributions as well as the overall results from all experimental techniques used allowed to suggest a structural model like polycyclic hydrocarbons, for calcined bakelite at 800 C. DOE

N93-31286# International Centre for Theoretical Physics, Trieste (Italy).
CALCULATIONS OF WAVEFUNCTIONS AND ENERGIES OF ELECTRON SYSTEM IN COULOMB POTENTIAL BY VARIATIONAL METHOD WITHOUT A BASIS SET
V. P. Bykov and A. V. Gerasimov Aug. 1992 17 p
(DE93-608161; IC-92/194) Avail: CASI HC A03/MF A01 (US Sales Only)

A new variational method without a basis set for calculation of the eigenvalues and eigenfunctions of Hamiltonians is suggested. The expansion of this method for the Coulomb potentials is given. Calculation of the energy and charge distribution in the two-electron system for different values of the nuclear charge Z is made. It is shown that at small Z the Coulomb forces disintegrate the electron cloud into two clots. DOE

N93-31335 National Physical Lab., Teddington (England). Radiation Science and Acoustics Div.
CHARACTERISATION OF A PROTECTION LEVEL Am-241 CALIBRATION SOURCE
G. A. Bass, M. J. Rossiter, and T. T. Williams Nov. 1992 12 p
(NPL-RSA(EXT)-35; ETN-93-93748) Copyright Avail: Issuing Activity (National Physical Lab., Teddington, Middlesex, TW11 0LW, England)

The various measurements involved in the commissioning process of an Am-241 radioactive source and transport mechanisms to be used for protection level calibration work are detailed. The source and its handling mechanisms are described and measurements to characterize the resultant gamma ray beam are described. For the beam measurements, the inverse square law is investigated and beam uniformity is assessed. A trial calibration of ionization chambers is described. The Am-241 irradiation facility is concluded to be suitable for calibrating secondary standards as part of the calibration service offered for protection level instruments. The umbra part of beam is acceptably uniform for a range of chambers and the measurements obtained were predictable and consistent. This quality will be added to the range of qualities offered as part of the protection level secondary standard calibration service. ESA

N93-31662# International Centre for Theoretical Physics, Trieste (Italy).
A 17 keV NEUTRINO AND LARGE MAGNETIC MOMENT SOLUTION OF THE SOLAR NEUTRINO PUZZLE
E. Kh. Akhmedov, G. Senjanovic, Zhijian Tao, and Z. G. Berezhiani (Ludwig-Maximilians-Univ., Munich, Germany.) Aug. 1992 11 p
(DE93-608264; IC-92/216; SISSA-141/92/EP; LMU-10/92) Avail: CASI HC A03/MF A01 (US Sales Only)

Zee-type models with Majorons naturally incorporate the 17 keV neutrino but in their minimal version fail to simultaneously solve the solar neutrino puzzle. If there is a sterile neutrino state, a particularly simple solution is found to the solar neutrino problem, which besides nu(sub 17) predicts a light Zeldovich-Konopinski-Mahmoud neutrino nu(sub light) = nu(sub e) + nu(sub mu)(sup c) with a magnetic moment being easily as large as 10(exp -11)(mu)(sub B) through the Barr-Freire-Zee mechanism. DOE

N93-31665# International Centre for Theoretical Physics, Trieste (Italy).
THE OPTICAL STARK EFFECT OF THE EXCITON DUE TO DYNAMICAL COUPLING BETWEEN QUANTIZED STATES OF THE ELECTRON AND HOLE IN QUANTUM WELLS
Nguyen Hong Quang Aug. 1992 10 p
(DE93-608520; IC-92/235) Avail: CASI HC A02/MF A01 (US Sales Only)

Optical Stark effect of the exciton in quantum wells is treated by taking into account not only dynamical coupling by pump field between quantized states of the electron in the conduction band but also the coupling between quantized states of the hole in the valence band. The changes in the calculated one-photon absorption probability by exciton depend essentially on pump field detuning. DOE

N93-31666# International Centre for Theoretical Physics, Trieste (Italy).
CHAOTIC DYNAMICS OF HIGH DENSITY PHOTON AND EXCITON SYSTEM
Nguyen Trung Dan, Nguyen Ba An, and Le Ngoc Mihn Aug. 1992 19 p
(DE93-608522; IC-92/247) Avail: CASI HC A03/MF A01 (US Sales Only)

Nonlinear dynamics of a system of interacting photons and excitons driven by a resonantly exciting light field were considered. Using the linear stability analysis for nonlinear coupled equations of photon and exciton operators, it was investigated that, besides the usual unstable domain which is negative slope branch, there are other unstable ones in the leftmost and rightmost sides of the lower and upper branches of the frequency-density bistable curves. Numerical study shows that the system has very rich information on the instability nature and a self-oscillation process leading to chaos can occur in these unstable domains. DOE

N93-31791 California Univ., Santa Barbara. Dept. of Chemistry.
THE CONDITIONS LEADING TO INTENSE LOW FREQUENCY GENERATION AND STRONG LOCALIZATION IN TWO LEVEL SYSTEMS Technical Report, 1 Jun. 1992 - 31 May 1993
Y. Dakhovskii and H. Metiu 20 May 1993 13 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-90-J-1209)
(AD-A265110) Avail: CASI HC A03

A charged particle in a double well can emit, when driven by an intense laser, intense low frequency radiation or become strongly localized in one of the wells. By using perturbation theory and asymptotic analysis, we determine the conditions for which these processes take place, for a two level model. DTIC

N93-31792 California Univ., Santa Barbara. Dept. of Chemistry.
THE OPTICAL RESPONSE OF A DOUBLE QUANTUM WELL DRIVEN BY TWO LASERS: LOCALIZATION AND LOW FREQUENCY GENERATION Technical Report, 1 Jun. 1992 - 31 May 1993
Yuri Dakhnovskii, Raanan Bavli, and Horia Metiu 20 May 1993 15 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-90-J-1209)
(AD-A265118) Avail: CASI HC A03

We study the time evolution of the dipole induced by two lasers acting on an electron confined to a double quantum well, for the case when the laser frequencies are closed to each other. The two fields can localize the electron or force it to emit intense low frequency radiation. DTIC

N93-31797# Wyoming Univ., Laramie. Dept. of Chemistry.
KINETICS OF MEDIATED ELECTRON TRANSFER BETWEEN VIOLOGEN GROUPS IN A SELF-ASSEMBLED MONOLAYER AND METAL COMPLEXES IN SOLUTION Technical Report No. 21, Jun. 1992 - May 1993
Thomas Schneider, Shauna Hiley, and Daniel A. Buttry 12 May 1993 30 p
(Contract N00014-90-J-1167)
(AD-A265729) Avail: CASI HC A03/MF A01

Self-assembled monolayers are used in an experimental configuration which allows the extraction of the cross reaction electron exchange rate constant for the electron transfer between a viologen group embedded within the SAM and a metal complex in solution. This cross reaction rate constant is compared with predictions from the Marcus theory using the cross reaction relation and the known self-exchange rate constants for the two reagents. The results reveal that the intrinsic barrier to the electron transfer is relatively unchanged in the SAM, while the rate constant is somewhat depressed due to the long distance over which the electron must transfer. DTIC

N93-31798# Florida Univ., Gainesville.
DEVELOPMENT OF PRACTICAL MO TECHNIQUES FOR PREDICTION OF THE PROPERTIES AND BEHAVIOR OF MATERIALS Final Report, 1 Nov. 1990 - 31 Oct. 1992
Michael J. Dewar May 1993 6 p
(Grant AF-AFOSR-0085-91)
(AD-A265730; AFOSR-93-0400TR) Avail: CASI HC A02/MF A01

The original SAM1 program has been completely rewritten and optimized, and geometry optimization is now carried out using analytical derivatives instead of finite difference. Satisfactory parameters for carbon and hydrogen were obtained. However, problems were found for the case of nitrogen and oxygen, particularly for compounds containing N-N bonds. Testing of SAM1 was carried out by performing calculations for an extensive set of molecular species for which apparently reliable experimental data are available. DTIC

N93-31805# International Centre for Theoretical Physics, Trieste (Italy).
RELAXATIONAL DYNAMICS AND PRECURSOR DOMAINS IN THE NON-LINEAR SHELL MODEL
M. Stachiotti (Instituto de Fisica Rosario, Argentina.), R. Migoni (Instituto de Fisica Rosario, Argentina.), and A. Dobry (Instituto de Fisica Rosario, Argentina.) Jun. 1992 14 p
(DE92-642676; IC-92/106) Avail: CASI HC A03/MF A01 (US Sales Only)

The dynamics of a two dimensional shell model with double-well core-shell interaction is simulated by means of a molecular dynamics technique. Snapshots of the lattice displacement pattern reveal the presence of precursor order domains near the ferroelectric transition while the dynamical structure factor exhibits a quasielastic component in addition to the ferroelectric soft mode peak. On the other hand, the local dynamics of particles is characterized by two different time scales corresponding to the coexistence of inter and intra-well motion. All these features are in qualitative agreement with experimental observations in several ferroelectric materials. DOE

N93-31810# National Inst. of Radiological Sciences, Chiba (Japan).
ANNUAL REPORT OF THE NATIONAL INSTITUTE OF RADIOLOGICAL SCIENCES Annual Report, FY 1990
Jan. 1992 266 p
(DE93-704237; NIRS-AR-34) Avail: CASI HC A12/MF A03 (US Sales Only)

The annual report for the activities of the National Institute of Radiological Sciences in Japan in the fiscal year 1990 is presented. The activities are divided into research, technical aids, training, medical services, management affairs at the Nakaminato Laboratory Branch Office, library or editing, international cooperation, and general affairs. Research activities are described under the following sections: (1) special researches covering biological risk evaluation in public exposure and exposure assessment in the environment and the public involved in food chain, medical use of accelerated heavy ions, and survey for the demonstration of dose-response relationships in low dose irradiation; (2) five assigned researches; (3) ordinary researches concerning physics, pharmacochemistry, biology, genetics, pathology and physiology, cell biology, internal exposure, environmental science, clinical research, clinical research for radiation injuries, medical use of heavy particles, environmental radiation ecology, and aquatic radiation ecology; (4) risk estimation of radiation; (5) survey for radiation response phenomena in fish and in immunity associated with low dose irradiation; (6) actual surveys for Bikini victims, population doses of medical and occupational exposure, and thorotrast exposure; (7) project research; (8) integrated atomic energy-based technological research; (9) radioactivity survey; (10) research supported by Science and Technology Agency aids; (11) International research cooperation; and (12) government-private joint cooperative study. Appendices include the personnel list and the bibliography of articles reported by the staff. DOE

N93-31813# International Atomic Energy Agency, Seibersdorf (Austria). Chemistry Unit.
RAPID INSTRUMENTAL AND SEPARATION METHODS FOR MONITORING RADIONUCLIDES IN FOOD AND ENVIRONMENTAL SAMPLES
Oct. 1992 38 p Presented at the 2nd Research Coordination Meeting, Vienna, Austria, 12-16 Aug. 1991
(DE93-608744; IAEA-AL-056; CONF-9108228) Avail: CASI HC A03/MF A01 (US Sales Only)

The purpose of this Second Research Coordinated Meeting (12-16 Aug. 1991) on Rapid Instrumental and Separation Methods for Monitoring Radionuclides in Food and Environmental Samples is to discuss the progress of the programs since the First Research Coordination Meeting, discuss how to validate the methodologies developed (e.g. reference samples, intercomparisons), and outline a schedule for CRP completion by the end of 1992. Radioactive contamination of the environment after a nuclear accident, such as had occurred at Chernobyl, is of serious concern to government officials and members of the general public. In 1990/1991 the Agency was asked to organize the International Chernobyl Project to assess the situation in the USSR. A network of laboratories was organized to carry out the environmental assessment needed for this project. The following recommendations are based on the experience gained by many of the laboratories involved in this project: (1) maintain a network of analytical laboratories with special skills and experience to provide assessments of radionuclide contamination in the environment in case of a radiological emergency; (2) methodologies for assessment of contamination in the environment should take into consideration potential trajectories, radioecology, and food chain parameters; (3) focus on areas of representative sample collection, in situ instrumental and chemical analysis, as well as advanced streamlined laboratory analyses which will facilitate the timeline of an assessment; (4) conduct intercomparison and testing of technologies, employing standard reference materials and procedures, and field measurements at significantly contaminated areas; and (5) conduct training of Member State laboratory personnel through fellowships, special courses, and workshops. DOE

N93-31821# International Centre for Theoretical Physics, Trieste (Italy).
THEORY OF DEEP-INELASTIC SCATTERING REACTIONS AND x-RESCALING MODEL
L. P. Kaptari (Joint Inst. for Nuclear Research, Moscow, USSR.) and A. Y. Umnikov (Far Eastern State Univ., Vladivostok, Russia.) Jul. 1992 21 p
(DE93-604519; IC-92/151) Avail: CASI HC A03/MF A01 (US Sales Only)

A point of view on the x-rescaling model in leptons-nucleus deep inelastic scattering is suggested. Using the operator product expansion method within the effective meson-nucleon theory, a rigorous consideration of the scattering on the deuteron is presented. It is demonstrated that with the contributions interpreted as the Fermi motion and mesonic corrections, the x-rescaling idea is exactly reproduced. The diagrams of the scattering off bound nucleons were also computed numerically. It is shown that taking into account the nuclear effects viz. shadowing and meson exchange currents the experimental behavior of the ratio of deuteron and nucleon structure functions as x approaches 0 is explained. The Gottfried integral is estimated as well. DOE

N93-31822# International Centre for Theoretical Physics, Trieste (Italy).
EXCITATION OF ATOMIC HYDROGEN
S. N. Tiwary (Centre National de la Recherche Scientifique, Paris, France.)

and D. D. Singh (Bihar Univ., India.) Jul. 1992 9 p
(DE93-604639; IC-92/147) Avail: CASI HC A02/MF A01 (US Sales Only)

The angular differential cross sections for the optically forbidden excitation e(-) + H(1s) yields e(-) + H(2s) as well as the optically allowed excitation e(-) + H(1s) yields e(-) + H(2p) transitions in the hydrogen atomic system by electron impact using the basic functions (1s-2s-2p) within the R-matrix method were calculated. Comparison is made with experimental and theoretical results. DOE

N93-31834# Osaka Univ., Ibaraki (Japan). Research Center for Nuclear Physics.
PROCEEDINGS OF THE WORKSHOP ON SPIN-CHARGE TRANSFER REACTION IN ATOMIC COLLISION PROCESS FOR PLANNING OF NEXT PERIOD OF CASCADE PROJECT
Mar. 1992 96 p Workshop held in Ibarakai, Japan, 29 Feb. 1992
(DE93-704290; RCNP-T-30; CONF-9202134) Avail: CASI HC A05/MF A01 (US Sales Only)

This workshop was held on 29 Feb. 1992, and was planned to investigate from the theoretical side the spin-charge transfer reaction which is used for a polarized heavy ion source, the development of which has been advanced in the Research Center for Nuclear Physics. In fiscal year 1992, the plan of installing an ECR ion source, Neomafios-10 GHz, as the AVF cyclotron external incident ion source is in progress. This external incidence system can be used also for the research on various atomic physics, in addition to the research on atomic nucleus physics. In this workshop, heated discussion was carried out on what research on atomic physics can be advanced in the Research Center for Nuclear Physics hereafter, through the investigation of the various problems that the atomic physics from low to high energy holds and new technical development. Particularly, the atomic physics using polarized ions seems to become a very unique study in the world. It seems proper to name this polarized heavy ion incidence system Spin Factory. DOE

N93-31863# Technical Research Centre of Finland, Espoo. Nuclear Engineering Lab.
ON THE QUANTITATIVE INTERPRETATION OF URANIUM SERIES DISEQUILIBRIA [URAANISARJOJEN RADIOAKTIIVISTEN EPAETASAPAINOJEN KVANTITATIIVISESTA TULKINNASTA]
Kari Rasilainen and Juhani Suksi Oct. 1992 80 p In FINNISH Sponsored by Kauppa-ja Teollisuusministerio, Helsinki, Finland, and Finnish Centre for Radiation and Nuclear Safety, Helsinki
(VTT-TIED-1404; ISBN-9-51-384218-5; ETN-93-94017) Copyright Avail: CASI HC A05/MF A01

The quantitative interpretation of radioactive disequilibria developed between radionuclides in natural decay chains is discussed. Due to the wide spectrum of radioactive half lives of the member nuclides, uranium series can retain information long times (350,000 years) about changes in the bedrock. Radioactive disequilibrium is the result of different physico-chemical behavior of nuclides under natural conditions. The geochemical behavior of important nuclides is known rather well, which provides a sound basis for using Uranium Series Disequilibrium (USD) method. A mathematical model was developed to simulate inventories of a four member (or shorter) radioactive decay chain in simplified systems. The systems can be periodically opening or continuously open in thermodynamical sense, which means that outside mass flows are periodical or continuous in nature, respectively. Both types of mass flow can be combined into continuous scenarios. The computer code URSE (URanium SEries disequilibria) was developed from the mathematical model. URSE was tested extensively by reference calculations with another code and by calculating relevant cases presented in the literature. The interpretation of uranium series disequilibria is based on the natural trend of decay chains to develop towards radioactive equilibrium. This equilibration process is disturbed by outside mass flows; the nature and time scale of the disturbance can be assessed from the degree of radioactive equilibrium of the system. The quantitative interpretation of uranium series disequilibria is a demanding task, because the system under study must be known theoretically first. On the other hand, using USD method, conceptual models of the system in situ can be validated over time scales of hundreds of thousands of years that cannot be achieved in laboratory or field experiments. ESA

N93-31907# Universidade Estadual de Campinas (Brazil). Inst. de Matematica, Estatistica e Ciencia da Computacao.
A GENERALIZATION OF DIRAC NON-LINEAR ELECTRODYNAMICS, AND SPINNING CHARGED PARTICLES
W. A. Rodrigues, Jr., J. Vaz, Jr., and E. Recami Aug. 1992 20 p
(DE93-609847; UNICAMP-IMECC-RP-24/92) Avail: CASI HC A03/MF A01 (US Sales Only)

The Dirac non-linear electrodynamics is generalized by introducing two potentials (namely, the vector potential a and the pseudo-vector potential (gamma(sup 5))B of the electromagnetic theory with charges and magnetic monopoles), and by imposing the pseudoscalar part of the product (omega)omega(sup *) to be zero, with omega = A + gamma(sup 5)B. Also, it is demonstrated that the field equations of such a theory possess a soliton-like solution which can represent a priori a charged particle, since it is endowed with a Coulomb field plus the field of a magnetic dipole. The rest energy of the soliton is finite, and the angular momentum stored in its electromagnetic field can be identified - for suitable choices of the parameters - with the spin of the charged particle. Thus this approach seems to yield a classical model for the charged (spinning) particle, which does not meet the problems met by earlier attempts in the same direction. DOE

N93-31913# Melbourne Univ., Parkville (Australia). School of Physics.
RANDOM WALKS AND A SIMPLE CHIRALLY INVARIANT LATTICE HAMILTONIAN WITHOUT FERMION DOUBLING
C. I. Belyea 1992 11 p
(DE93-609920; UM-P-91/93; OZ-91/20) Avail: CASI HC A03/MF A01 (US Sales Only)

It is shown that there is a simple chirally-invariant lattice Hamiltonian for fermions which is doubling-free but non-Hermitian and which may be valuable in lattice Hamiltonian studies of quantum chromodynamics. A connection is established between the existence of random walk representations of spinor propagators and this doubling-free formulation, in analogy with Wilson fermions. DOE

N93-31995# Naval Research Lab., Washington, DC.
CYCLOCARBON COALESCENCE: MECHANISMS FOR TAILORMADE FULLERENE FORMATION
Stephen W. McElvany, Mark M. Ross, Nancy S. Goroff, and Francos Diederich 27 May 1993 17 p
(AD-A265489; TR-1) Avail: CASI HC A03/MF A01

The availability of macroscopic quantities of fullerenes has resulted in a vast number of physical and chemical studies of these new materials. However, the mechanisms that lead to the formation of these spherical carbon allotropes are not well understood. Mass spectral evidence has been obtained for the size-selective growth of fullerenes through the coalescence of cyclo(n)carbons, molecular carbon allotropes consisting of monocyclic rings with n carbon atoms. Whereas coalescence of cyclo(30)carbon (cyclo-C30) produces predominantly buckminster fullerene (C60), the smaller rings cyclo-C18 and cyclo-C24 preferentially produce fullerene C70 through distinct intermediates. The present studies not only provide new insights into fullerene formation mechanisms but also raise the possibility of tailoring the size distributions of fullerenes by variation of the appropriate properties of the precursors. DTIC

N93-32026# Melbourne Univ., Parkville (Australia). School of Physics.
MASSIVE NEUTRINOS
G. Taylor and S. Tovey 1992 10 p
(DE93-609989; UM-P-92/41) Avail: CASI HC A02/MF A01 (US Sales Only)

Neutrinos have intrigued physicists for over 60 years, yet it still is not determined if they possess a mass. Spontaneous oscillations between the various types of neutrinos, in analogy with the observed flavor oscillations between quarks, would be irrefutable evidence for non-zero neutrino mass. A group of experimental physicists from Australia joined a new experiment to search for neutrino oscillations and the importance of searching for such phenomena is reviewed. DOE

N93-32032 Stanford Univ., CA. Knowledge Systems Lab.
INFRARED MULTIPLE PHOTON DISSOCIATION SPECTRA OF GASEOUS IONS Technical Report, Sep. 1991 - Jan. 1993
Dilrukshi M. Peiris, Mitchell A. Cheeseman, Ragulan Ramanathan, and John

R. Eyler 5 May 1993 23 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract N00014-87-J-1248)
(AD-A264378; TR-41) Avail: CASI HC A03

Infrared multiple photon dissociation (IRMPD) spectra in the 9.2 - 10.8 microns wavelength range have been obtained for the protonated molecular ions of 3-bromopropene and gallium hexafluoroacetylacetonate, using one and two lasers. Use of a low power tunable CO2 laser and a modified White-type multipass FTICR cell has helped to overcome some limitations of this technique including a limited tuning range and/or low output power in one-laser experiments. Comparisons between the ion spectra and those of the corresponding neutral species are made. DTIC

N93-32159# Oregon Univ., Eugene. Inst. of Theoretical Science.
TWO JET PRODUCTION IN HADRON COLLISIONS AT ORDER ALPHA(SUB s)(SUP 3) IN QCD
S. D. Ellis, Z. Kunszt (Eidgenoessische Sternwarte, Zurich, Switzerland.), and D. E. Soper Jul. 1992 12 p
(Contracts DE-FG06-85ER-40224; DE-FG06-91ER-40614)
(DE93-010563; DOE/ER-40224/244; OITS-495) Avail: CASI HC A03/MF A01

The two-jet inclusive cross section at order alpha(sub s)(sup 3) in QCD is calculated. Because the one-loop perturbative corrections are included, there is a considerable improvement in theoretical accuracy compared to the Born-level calculation. The predicted dependence of the cross section on the jet-jet scattering angle eta(sub 1) - eta(sub 2) is compared to data from the CDF collaboration. The dependence of the cross section on the jet-jet mass is also discussed. DOE

N93-32162# Clark-Atlanta Univ., GA.
THEORETICAL INVESTIGATION OF ELECTRON-POSITIVE ION/ATOM INTERACTIONS
A. Z. Msezane 1992 5 p
(Contract DE-FG05-84ER-13266)
(DE93-012933; DOE/ER-13266/T4) Avail: CASI HC A01/MF A01

Very brief summaries are given on three research topics. Electron impact elastic, excitation, and total cross sections for K were investigated by using elaborate CI target wave functions in the close-coupling approximation. Photoionization cross sections from ground-state Na were calculated near the 2s(sup 2)2p(sup 5)3s and 2s2p(sup 6)3s inner-shell thresholds; also, the photoionization cross sections of excited 3p(sup 2)P(sup o) and 3d(sup 2)D states were calculated with the R-matrix methodology near the 2s2p(sup 6)3s thresholds. A numerical approach was developed to calculate the charge transfer matrix elements for ion-atom(ion) collisions; this was used for the proton-hydrogen collision problem as an illustration. DOE

N93-32294# Fermi National Accelerator Lab., Batavia, IL.
STERILE NEUTRINOS AS DARK MATTER
S. Dodelson and L. M. Widrow (Queens Univ., Kingston, Ontario.) Mar. 1993 11 p
(Contract DE-AC02-76CH-03000)
(DE93-012533; FNAL/Pub-93/057-A) Avail: CASI HC A03/MF A01

The simplest model that can accommodate a viable nonbaryonic dark matter candidate is the standard electroweak theory with the addition of right-handed or sterile neutrinos. This model has been studied extensively in the context of the hot dark matter scenario. We reexamine this model and find that hot, warm, and cold dark matter are all possibilities. We focus on the case where sterile neutrinos are the dark matter. Since their only direct coupling is to left-handed or active neutrinos, the most efficient production mechanism is via neutrino oscillations. If the production rate is always less than the expansion rate, then these neutrinos will never be in thermal equilibrium. However, they may still play a significant role in the dynamics of the Universe and possibly provide the missing mass necessary for closure. We consider a single generation of neutrino fields (nu(sub L), nu(sub R)) with a Dirac mass, (mu), and a Majorana mass for the right-handed components only, M. For M much greater than (mu) we show that the number density of sterile neutrinos is proportional to (mu)(sup 2)/M so that the energy density today is independent of M. However M is crucial in determining the large scale structure of the Universe. In particular, M approx. equal to 0.1-1.0 keV leads to warm dark matter and a structure formation scenario that may have some advantages over both the standard hot and cold dark matter scenarios. DOE

N93-32300# Los Alamos National Lab., NM.
SOME OUTSTANDING ISSUES IN PION SCATTERING AT ENERGIES ABOVE THE (DELTA) RESONANCE
C. L. Morris and J. D. Zumbro 1993 13 p Presented at the Future Directions in Particle and Nuclear Physics at Multi-GeV Hadron Beam Facilities, Upton, NY, 4-6 Mar. 1993
(Contract W-7405-eng-36)
(DE93-012747; LA-UR-93-1502; CONF-930389-7) Avail: CASI HC A03/MF A01

The Delta(1232) resonance dominates pion-nucleon scattering at energies below 300 MeV, the region in which pion-nucleus scattering has been well studied using spectrometers at the meson factories. Above this energy region little pion-nucleus scattering data exists. Recently, spectrometers at Brookhaven, LAMPF, KEK, and DUBNA have been used to obtain initial data for pion-nucleus scattering in this energy region. In this talk we review some data that have been obtained using the LAS spectrometer at LAMPF. DOE

N93-32312# University of Southern Mississippi, Hattiesburg. Dept. of Polymer Science.
STRUCTURAL CHARACTERIZATION OF NYLON 7 BY SOLID-STATE NMR, DSC, AND ATR-FTIR Technical Report, 1 Jun. 1992 - 31 May 1993
C. G. Johnson and L. J. Mathias 7 Jun. 1993 35 p
(Contract N00014-89-J-1225)
(AD-A265800; TR-52) Avail: CASI HC A03/MF A01

Samples of commercial nylon 7 were given different thermal or precipitation histories. Structure and crystallinity were followed by DSC, solid-state NMR, and attenuated total reflectance FTIR (ATR-FTIR). Delta H and T(sub m) values ranged from 52 to 93 J/g and 228 to 242 C, respectively. Surprisingly, annealing did not give material with the greatest delta H although it possessed the highest melting point. Solid-state C-13 and N-15 NMR methods were used to observe the amorphous and crystalline fractions. For example, the amide nitrogens show resonances near 86.5 ppm in amorphous domains, near 84 ppm in alpha-crystals, and near 89 ppm in gamma-crystals. N-15 CP/MAS spectra of solution cast samples contained peaks consistent with all three domains in various intensity ratios but with the gamma-peak being the most intense for most samples. Solid-state C-13 spectra contained peaks which supported the presence of these phases but with the alpha-phase peaks predominating. DTIC

N93-32407# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR). Inst. Yadernoj Fiziki.
NUCLEAR STRUCTURE EFFECTS IN ELASTIC AND INELASTIC SCATTERING OF LIGHT IONS
B. S. Galakhmatova, A. G. Katashev, E. A. Romanovskj, and K. V. Shitikova 1991 13 p
(DE93-616909; INP-MSU-91-41-245; NIIYaF-MGU-91-41-245) Avail: CASI HC A03/MF A01 (US Sales Only)

Elastic and inelastic scattering of light ions with the excitation of the monopole states has been analyzed with respect to the information on the radial shape of the nuclear matter distributions of the target nuclei. The possible manifestation of the nuclear structure in these processes is being investigated. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory. For space radiation see *93 Space Radiation.*

N93-32369*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
GEOMETRIC MODEL FROM MICROSCOPIC THEORY FOR NUCLEAR ABSORPTION
Sarah John (Vigyan Research Associates, Inc., Hampton, VA.), Lawrence W. Townsend, John W. Wilson, and Ram K. Tripathi (Vigyan Research Associates, Inc., Hampton, VA.) Washington Jul. 1993 33 p
(RTOP 593-42-21-01)
(NASA-TP-3324; L-17187; NAS 1.60:3324) Avail: CASI HC A03/MF A01

A parameter-free geometric model for nuclear absorption is derived

herein from microscopic theory. The expression for the absorption cross section in the eikonal approximation, taken in integral form, is separated into a geometric contribution that is described by an energy-dependent effective radius and two surface terms that cancel in an asymptotic series expansion. For collisions of light nuclei, an expression for the effective radius is derived from harmonic oscillator nuclear density functions. A direct extension to heavy nuclei with Woods-Saxon densities is made by identifying the equivalent half-density radius for the harmonic oscillator functions. Coulomb corrections are incorporated, and a simplified geometric form of the Bradt-Peters type is obtained. Results spanning the energy range from 1 MeV/nucleon to 1 GeV/nucleon are presented. Good agreement with experimental results is obtained. Author

74 OPTICS

Includes light phenomena; and optical devices.
For lasers see *36 Lasers and Masers.*

N93-31056# National Aerospace Lab., Amsterdam (Netherlands). Space Div.
ON BOARD IMAGE PROCESSING FOR TELESCIENCE SUPPORT
E. A. Kuijpers 17 Jun. 1991 14 p Presented at 1st ESA Workshop on Computer Vision and Image Processing for Spaceborne Applications, ESTEC, Noordwijk, Netherlands, 10-12 Jun. 1991
(Contract NIVR-02607N)
(NLR-TP-91213-U; ETN-93-94062; AD-B169115L) Avail: CASI HC A03/MF A01

The realizability of the telescience concept depends on the performance and integration of remotely controlled instruments. Local image processing in experiment facilities may contribute in solving problems related to remote control based on visual information in the presence of communication constraints. A simulation set up based on an optical diagnostic instrument breadboard, called Teleoperated Prototype Optical Diagnostic Instrument (TelePODI), is described. This simulation set up is used to analyze the concept of onboard image processing for telescience support. It is demonstrated that such processing may be a useful tool for: better information presentation, teleoperator support in instrument control, flexibility in instrument design, and assistance in experiment evaluation. ESA

N93-31090# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics.
THE DETERMINATION OF THE THICKNESS OF THE FILM MATERIALS BY THE PIXE METHOD [RENTGENOSPEKTRAL'NOE OPREDELENIE TOLSHSHINY PLENOCHNYKH MATERIALOV PRI PROTONNOM VOZBUZHDENII]
S. M. Blokhin (Rostov State Univ., Rostov-on-Don, USSR.), A. A. Vlasov (Rostov State Univ., Rostov-on-Don, USSR.), A. P. Kobzev, and D. M. Shirokov 1991 7 p In RUSSIAN
(DE93-607555; JINR-R-14-91-458) Avail: CASI HC A02/MF A01 (US Sales Only)

The method for the determination of the thickness of a homogeneous film based on the particle induced X-ray emission (PIXE) technique is described. Different variants of the given method with the use of a standard sample and without one, as well as the case of measuring a relative change of a thickness, are discussed. The results of the determination of the ZnO films thickness in comparison with the measurements conducted by the backscattering and optical methods are presented. DOE

N93-31118# National Aerospace Lab., Amsterdam (Netherlands). Space Div.
TELESCIENCE PILOT EXPERIMENT RESULTS USING telePODI Final Report
E. A. Kuijpers 30 Dec. 1990 84 p
(Contracts NIVR-02607N; ESA-8522/89/NL/SF)
(NLR-TP-90326-U; ETN-93-94058) Avail: CASI HC A05/MF A01

The Prototype Optical Diagnostic Instrument (PODI) was extended to teleoperated PODI (telePODI) to be applied in the study of telescience and image processing for microgee related instrumentation. TelePODI was integrated in the Telescience Test Bed, phase 1, at ESTEC to simulate remote control. Telescience pilot experiments were executed during two evaluation periods. The experiments were related to: optical systems check, experiment cell exchange, liquid handling, diagnostic performance verification, telemetry and telecommand handling, video handling, preprogramming, reprogramming, remote execution of plume experiment. The evaluation included experiments in which telePODI was integrated in the Telescience Test Bed and controlled via Olympus. The integration and evaluation in the Telescience Test Bed is reported. ESA

N93-31165# National Lab. for High Energy Physics, Ibaraki (Japan).
PROCEEDINGS OF THE WORKSHOP ON APPLICATION OF CIRCULARLY POLARIZED X RAYS IN THE REGION OF 1 TO 8 keV
Masaharu Nomura, ed. and Toshiaki Iwazumi, ed. Jan. 1992 109 p Workshop held in Tsukuba, Japan, 21-22 Dec. 1990
(DE93-704276; KEK-PROC-91-15; CONF-9012154) Avail: CASI HC A06/MF A02

In the Photon Factory of the National Laboratory for High Energy Physics, the inserted light source that generates powerful circularly polarized synchrotron radiation was in the development and manufacture stage, and recently No. 2 machine was completed and installed in BL-28 of the 2.5 GeV ring. This equipment emits the circularly polarized synchrotron radiation in vacuum ultraviolet region when it is operated by undulator mode and that in the region from soft x-ray to x-ray when it is operated by wiggler mode. The recent world trend in the development of inserted light sources aims at creating the light of special polarization condition, not only obtaining the light of high luminance, and the research and development in the Photon Factory leads this trend. This workshop aims at exploring the best way for obtaining the results of research utilizing this superiority of the Photon Factory. This workshop was held on 21-22 Dec. 1990 at the Laboratory in Tsukuba. DOE

N93-31246# Melbourne Univ., Parkville (Australia). School of Physics.
A SELF-ALIGNING INTERFEROMETER SUITABLE FOR WHITE OR MONOCHROMATIC LIGHT CONSISTING SOLELY OF A MIRROR AND A REFLECTION GRATING, PART 2
S. J. Wark and G. I. Opat 1991 27 p
(DE93-609517; UM-P-91/44) Avail: CASI HC A03/MF A01 (US Sales Only)

The performance of the self-aligning interferometer constructed solely from a mirror and reflection grating is experimentally investigated. The observations show good agreement with calculations using both the exact optical theory, and agreement at the level expected with the leading order terms in a convenient approximation. DOE

N93-31799# California Univ., Santa Barbara. Dept. of Electrical and Computer Engineering.
EFFICIENT OPTICAL LOGIC, INTERCONNECTIONS AND PROCESSING USING QUANTUM CONFINED STRUCTURES Final Report, 30 Sep. 1989 - 31 Mar. 1993
L. A. Coldren, A. C. Gossard, C. C. Barron, G. Thompson, and M. Whitehead 30 Apr. 1993 82 p
(Grant AF-AFOSR-0549-89)
(AD-A265734; ECE-TR-93-10; AFOSR-93-0395TR) Avail: CASI HC A05/MF A01

This is the final report of AFOSR-89-0549. It summarizes work extending over the entire contract period which began 30 Sept 1989. The work is not reported in chronological order. Rather, it is organized according to subject, and it is intended to be somewhat tutorial, although only work at UCSB is included. DTIC

N93-31841*# Tennessee Technological Univ., Cookeville. Center for Manufacturing Research and Technology Utilization.
DESIGN OF COUPLED MACE FILTERS FOR OPTICAL PATTERN RECOGNITION USING PRACTICAL SPATIAL LIGHT MODULATORS Final Report
P. K. Rajan and Ajmal Khan Jun. 1993 128 p
(Grant NAG9-614)
(NASA-CR-193192; NAS 1.26:193192) Avail: CASI HC A07/MF A02

Spatial light modulators (SLMs) are being used in correlation-based optical pattern recognition systems to implement the Fourier domain filters. Currently available SLMs have certain limitations with respect to the realizability of these filters. Therefore, it is necessary to incorporate the SLM constraints in the design of the filters. The design of a SLM-constrained minimum average correlation energy (SLM-MACE) filter using the simulated

annealing-based optimization technique was investigated. The SLM-MACE filter was synthesized for three different types of constraints. The performance of the filter was evaluated in terms of its recognition (discrimination) capabilities using computer simulations. The correlation plane characteristics of the SLM-MACE filter were found to be reasonably good. The SLM-MACE filter yielded far better results than the analytical MACE filter implemented on practical SLMs using the constrained magnitude technique. Further, the filter performance was evaluated in the presence of noise in the input test images. This work demonstrated the need to include the SLM constraints in the filter design. Finally, a method is suggested to reduce the computation time required for the synthesis of the SLM-MACE filter. Author (revised)

N93-31915# Naval Command, Control and Ocean Surveillance Center, San Diego, CA. RDT and E Div.

DEVELOPMENT OF JITTER MEASUREMENT PROCEDURES FOR DIGITAL FIBER OPTIC MODULES

D. R. Butts and D. C. Evans Feb. 1993 6 p

(AD-A265550) Avail: CASI HC A02/MF A01

This paper describes work in progress to develop procedures for measuring jitter associated with fiber optic modules. These procedures support associated specifications by identifying the method by which conformance with technical requirements should be determined. Technical requirements are based on SAFENET/2/FDDI system requirements. FDDI requirements and suggested test procedures are discussed and evaluated. DTIC

N93-31987# Brookhaven National Lab., Upton, NY.

ADAPTIVE OPTICS FOR HIGH POWER BEAM LINES USING DIAMOND CRYSTAL MONOCHROMATORS

S. Sharma, L. E. Berman, J. B. Hastings, and M. Hart (Manchester Univ., England.) 1992 17 p Presented at the Society of Photo-Optical Instrumentation Engineers (SPIE) International Symposium on Optical Applied Science and Engineering, San Diego, CA, 19-24 Jul. 1992

(Contract DE-AC02-76CH-00016)

(DE93-009328; BNL-48490; CONF-920792-50) Avail: CASI HC A03/MF A01

Preserving the high source brightness of the third generation of synchrotron radiation facilities will require that thermal and pressure deformations of the monochromator crystals be maintained within a few arc-seconds. Recent experiments at the National Synchrotron Light Source (NSLS) have demonstrated the potential of adaptive crystal optics to cope with high power densities. In this technique, the crystal deformations are minimized both by an efficient water-jet cooling and by externally applied pressure loads. Thermal deformation can be reduced further with diamond crystals because of their high thermal conductivity and low coefficient of thermal expansion. In this paper, we describe the results achieved by optimization of adaptive crystal optics for diamond crystals. DOE

N93-32050# Washington Univ., Seattle. Dept. of Electrical Engineering.

QUANTUM WELL OPTICAL WAVEGUIDE MODULATORS Final Report

Sinclair Yee and Kelin Kuhn 14 May 1993 6 p

(Contract N00014-91-J-1662)

(AD-A265421) Avail: CASI HC A02/MF A01

The purpose of this project was to examine several different quantum well waveguide modulator designs with the goal of developing a quantum well waveguide optical modulator suitable for integration into 3-5 opto-electronic integrated circuits. DTIC

N93-32378*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

DEVELOPMENT OF A LARGE FIELD-OF-VIEW KD POTASSIUM DI-DEUTERIUM PHOSPHATE MODULATOR: CENTER DIRECTOR'S DISCRETIONARY FUND Final Report

E. A. West Jun. 1993 48 p

(Proj. 91-23)

(NASA-TM-108410; NAS 1.15:108410) Avail: CASI HC A03/MF A01

Magnetographs, which measure polarized light, allow solar astronomers to infer the magnetic field intensity on the Sun. The Marshall Space Flight Center (MSFC) Vector Magnetograph is such an imaging instrument. The instrument requires rapid modulation between polarization states to minimize seeing effects. The accuracy of those polarization measurements is dependent on stable modulators with small field-of-view errors. Although these devices are very important in ground-based telescopes, extending the field of view of electro-optical crystals such as KD*Ps (potassium di-deuterium phosphate) could encourage the development of these devices for other imaging applications. The work that was done at MSFC as part of the Center Director's Discretionary Fund (CDDF) to reduce the field-of-view errors of instruments that use KD*P modulators in their polarimeters is described. Author (revised)

N93-32421# Technical Research Centre of Finland, Espoo. Medical Engineering Lab.

MODELING OF OPTICAL WAVEGUIDE BIOSENSOR STRUCTURES

Jyrki Kimmel Sep. 1992 110 p Sponsored by Utah Univ.; Technical Research Centre of Finland, Espoo; Instrumentarium Science Foundation; and Academy of Finland Original contains color illustrations

(VTT-PUBS-112; ISBN-9-51-384230-4; ETN-93-94021) Copyright Avail: CASI HC A06/MF A02

A study of modeling, fabrication and characterization of integrated optical fluorescence sensors is presented. Finite Difference Time Domain (FDTD) modeling was applied to the design of the device. FDTD is a numerical method for solving Maxwell's equations for electromagnetic fields in a discretized space and time grid. Benefits of the method include savings in computer memory storage and execution times, and the possibility to take the near field features of the model in account. The fluorescence sensor component was designed so that with correct choice of parameters, both evanescent excitation and side collection of emitted fluorescence could be maximized. The component was fabricated by sputtering quartz in a fused silica substrate in presence of nitrogen gas. The devices were characterized by various methods to get a physical picture of the properties of the sensor. Another FDTD model was subsequently developed to evaluate the performance of the component in fluorescence sensing applications. The result of the work was validation of FDTD as a tool to solve optical problems. In the characterization, a new method was developed for loss measurements of waveguides based on CCD (Charge Coupled Device) imaging. The results of the study indicate that the fabricated components are well suited for fluorescence sensing applications. ESA

N93-31283# Deutsche System-Technik G.m.b.H., Bremen (Germany).

TESTING OF AN EXPERIMENTAL SYSTEM FOR IMAGE RECONNAISSANCE

H. Keil and P. Schulz (Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick, Germany.) *In* ESA, Flight Test of Avionic and Air-Traffic Control Systems Jan. 1993 p 249-263 Transl. into ENGLISH from Flugerprobung von Avionik und Flugsicherungssystemen (Brunswick, Germany, DLR) Jul. 1991 p 233-246 Original language document was announced as N92-25602 (For primary document see N93-31271 12-04)

Avail: CASI HC A03/MF A03; original German version available from DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany

N93-31783# Observatoire de Paris-Meudon (France).

INTEGRATED OPTICS FOR AN INTERFEROMETRIC LINK

V. CoudeduForesto, Stephen T. Ridgway (Kitt Peak National Observatory, Tucson, AZ.), and J.-M. Mariotti *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 219-224 (For primary document see N93-31750 12-89)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31784# Observatoire de Paris-Meudon (France).

IR SINGLE-MODE FIBER OPTICS FOR DOUBLE FOURIER INTERFEROMETRY

Pei-Qian Zhao, J.-M. Mariotti, P. Lena, and V. CoudeduForesto *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 225-230 (For primary document see N93-31750 12-89)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-32105*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

SENSOR FUSION FOR ASSURED VISION IN SPACE APPLICATIONS

Marie-France Collin and Kumar Krishen *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 72-85 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N93-31084# International Centre for Theoretical Physics, Trieste (Italy).
ARE THERE MISSING CONVECTIVE CURRENTS?
C. Y. Chen 1992 7 p
(DE93-604672; IC-92/159) Avail: CASI HC A02/MF A01 (US Sales Only)

It is revealed that as far as distribution functions obtained from gyrokinetic equations are concerned, the standard formulae to evaluate currents in plasmas are not applicable due to the fact that those distribution functions are given in a moving coordinate frame and the moving is essentially related to perturbed fields. With heuristic and analytic approaches, appropriate formulae are obtained to evaluate several types of currents in plasmas of which some have been missing in previous approaches. DOE

N93-31097# Japan Atomic Energy Research Inst., Tokyo.
TOKAMAK PLASMA SHAPE IDENTIFICATION BASED ON THE BOUNDARY INTEGRAL EQUATIONS
Kenichi Kurihara and Toyoaki Kimura May 1992 22 p
(DE93-715383; JAERI-M-92-075) Avail: CASI HC A03/MF A01 (US Sales Only)

A necessary condition for tokamak plasma shape identification is discussed and a new identification method is proposed. This method is based on the boundary integral equations governing a vacuum region around a plasma with only the measurement of either magnetic fluxes or magnetic flux intensities. It can identify various plasmas with low to high ellipticities with the precision determined by the number of the magnetic sensors. This method is applicable to real-time control and visualization using a 'table-look-up' procedure. DOE

N93-31164# International Centre for Theoretical Physics, Trieste (Italy).
NEW EDGE MAGNETOPLASMON FOR A TWO-DIMENSIONAL ELECTRON GAS IN A RING GEOMETRY
C. R. Proetto Sep. 1992 12 p
(DE93-608737; IC-92/244) Avail: CASI HC A03/MF A01 (US Sales Only)

The dynamical response of a classical two-dimensional electron gas confined in a ring geometry under a perpendicular magnetic field is analyzed. Within the hydrodynamical approach and in the strong magnetic field limit, a new set of antidot edge magnetoplasmons is obtained, corresponding to density oscillations circulating along the inner boundary of the ring and whose frequency increases with magnetic field. The associated self-induced distribution of densities and currents are presented, together with an analysis of the size dependence of these perimeter waves. DOE

N93-31309*# National Aeronautics and Space Administration, Washington, DC.
FUSION ENERGY FOR SPACE: FEASIBILITY DEMONSTRATION. A PROPOSAL TO NASA
Norman R. Schulze Oct. 1992 50 p
(NASA-TM-109227; NAS 1.15:109227) Avail: CASI HC A03/MF A01

This proposed program is to initiate a space flight research and development program to develop fusion energy for the space applications of direct space propulsion and direct space power, that is, a Space Fusion Energy (SFE) program. 'Direct propulsion' refers to the use of plasma energy directly for thrust without requiring other energy conversion systems. Further, to provide space missions with large electrical power, 'direct space power' is proposed whereby the direct conversion of charged particles into electricity is used, thereby avoiding thermal conversion system losses. The energy release from nuclear fusion reactions makes these highly efficient, high power space systems possible. The program as presented conducts in an orderly, hierarchical manner the necessary planning, analyses, and testing to demonstrate the practical use of fusion energy for space. There is nothing discussed that is known to be theoretically impossible. Validation of the engineering principles is sought in this program which uses a cost-benefit approach. Upon successful program completion, space will become more accessible and space missions more safely conducted. The country will have taken a giant step toward the commercialization of space. The mission enabling capability provided by fusion energy is well beyond mission planners' current dreams. Author (revised)

N93-31542# Royal Inst. of Tech., Stockholm (Sweden). Alfven Lab.
MULTICOMPONENT DOUBLE LAYERS
Per Carlqvist Sep. 1992 12 p Presented at the 4th Symposium on Double Layers and Other Nonlinear Potential Structures in Plasma, Innsbruck, Austria, 6-8 Jul. 1992
(TRITA-ALP-92-03; ETN-93-94212) Avail: CASI HC A03/MF A01

A model of a multicomponent double layer is considered. For the sake of simplicity it is assumed that the layer is steady, strong, and nonrelativistic. The multicomponent double layer is composed of several different kinds of positively and negatively charged particles. On the basis of the model a current condition is derived for the layer which describes the proportions of the current densities of the different charge components that are possible. The internal structure of the double layer is also investigated. It is demonstrated that the density distribution of each of the components is of the same shape as the density distributions of the components of a corresponding two component layer. Similarly it is shown that the potential distribution within the layer is of the same shape as that of the two component layer. The potential drop across the layer is found to be a function of the thickness of the layer and of the different current densities. It is pointed out that the multicomponent double layer may give rise to a selective acceleration of particles so that the abundance of elements among the accelerated particles need not necessarily be the same as the abundance of elements in the ambient plasma. This property may be of some significance especially in connection with double layers occurring in cosmic plasmas. ESA

N93-31626# Royal Inst. of Tech., Stockholm (Sweden). Alfven Lab.
THE DYNAMICS AND STABILITY OF WEAK DOUBLE LAYERS
Michael A. Raadu Sep. 1992 19 p Presented at the 4th Symposium on Double Layers and Other Nonlinear Potential Structures in Plasma, Innsbruck, Austria, 6-8 Jul. 1992 Sponsored by Swedish Natural Science Research Council, Stockholm
(TRITA-ALP-92-02; ETN-93-94211) Avail: CASI HC A03/MF A01

The evolution, dynamics and stability of weak double layers are reviewed. Steady state Double Layers (DLs) have been extensively studied as time independent solutions of the coupled Vlasov and Poisson equations, and their structure is well understood. However the accessibility of these double layers from general initial plasma states and their stability to perturbations raise many questions. The requirements of exact time independence is to some extent an overrestriction on the models and existence criteria. In general the most straightforward way to treat time dependent DLs is by computer simulation; but such studies are restricted to one case at a time, making it difficult to obtain general results unless they can be complemented with analytical work. Weak DLs, with amplitudes comparable to or less than the plasma thermal energy, have been classified in terms of steady state solutions and in the case of time dependence are amenable to both analytical and computational treatment. The dynamics of a whole class of weak ion-acoustic DLs has been shown to be described by a modified Korteweg-de Vries equation. Inverse scattering theory has led to the discovery of the necessary and sufficient conditions for the formation of such weak DLs from arbitrary initial conditions. The description may be generalized to two dimensions in the case of magnetized (modified Zakharov-Kuznetsov equation) and unmagnetized (modified Kadomtsev-Petviashvili equation) plasmas. Perturbation analysis shows stability in the magnetized and instability in the unmagnetized case. The effects of Landau damping may be added to the mKdV description, but the full consequences of this remain to be analyzed. More detailed comparisons with experiments are needed. ESA

N93-31667# International Centre for Theoretical Physics, Trieste (Italy).
NONLINEAR RADIATION OF WAVES AT COMBINATION FREQUENCIES DUE TO RADIATION-SURFACE WAVE INTERACTION IN PLASMAS

I. A. ElNaggar (Alexandria Univ., Egypt.), A. M. Hussein, and Sh. M. Khalil Sep. 1992 8 p
(DE93-608570; IC-92/256) Avail: CASI HC A02/MF A01 (US Sales Only)

Electromagnetic waves radiated with combination frequencies from a semi-bounded plasma due to nonlinear interaction of radiation with surface wave (both of P-polarization) was investigated. Waves radiated both into vacuum and plasma are found to be P-polarized. The continuity at the plasma boundary of the tangential components of the electric field of the waves is taken into consideration. The case of normal incidence of radiation and rarefied plasma layer is also studied. DOE

N93-31668# International Centre for Theoretical Physics, Trieste (Italy).
KINETIC NONLINEAR ELECTRON-ION TWO STREAM INSTABILITY IN FIELD-FREE ISOTHERMAL PLASMA
Sh. M. Khalil and Y. A. Sayed Sep. 1992 8 p
(DE93-608571; IC-92/257) Avail: CASI HC A02/MF A01 (US Sales Only)

A nonlinear dispersion relation is derived and solved for a 1-D electron-ion two-stream (Buneman) instability which excited in isothermal field-free plasma. The major nonlinear mechanism is the quasilinear modification of the background distribution functions. The effect of the pair Coulomb collisions is taken into effect. The methods used to solve the Vlasov's kinetic equation may also be used to investigate other types of current micro-instabilities in plasma. DOE

N93-31673# International Centre for Theoretical Physics, Trieste (Italy).
COMPUTER SIMULATION OF ENERGY PROFILES IN A PLASMA FOCUS DEVICE
F. B. Sigalo and A. V. Gholap Sep. 1992 17 p
(DE93-608560; IC-92/253) Avail: CASI HC A03/MF A01 (US Sales Only)

The study of the dynamics of the plasma focus device was treated to include the distribution profiles of kinetic energy, electrical energy, and power input within the axial phase. The Snowplow model equation for plasma motion in one dimension and the equations for energies were programmed for computer simulation. The distribution of the energies show strong dependence on the ratio of the periodic time of the external circuit to the transit time of the current sheath motion in the axial phase. DOE

N93-31998# North Carolina Univ., Chapel Hill. Dept. of Chemistry.
AN ELECTRON CYCLOTRON RESONANCE PLASMA PROCESS FOR InP PASSIVATION Technical Report
Y. Z. Hu, M. Li, Y. Wang, and E. A. Irene 4 May 1993 16 p
(Contract N00014-89-J-1178)
(AD-A265036; TR-51) Avail: CASI HC A03/MF A01

In-situ ellipsometry has been used to monitor electron cyclotron resonance (ECR) plasma oxidation of InP at room temperature in the shadow plasma between a shutter and the sample. This process leaves no detectable excess P at the InP-oxide interface. A capping layer of SiO2 was grown by ECR chemical-vapor deposition at a substrate temperature of 150 deg C. The samples were rapid-thermal annealed at 500 deg C for 1 min in an oxygen ambient. The dielectric layers were evaluated by current-voltage and capacitance-voltage measurements on metal-oxide n-type InP capacitors. DTIC

N93-32020# Naval Research Lab., Washington, DC.
RADIATIVE PREHEAT IN STRONGLY COUPLED, LASER ACCELERATED PLASMAS Final Report
John L. Giuliani, Jr., Margaret Mulbrandon, and Jack Davis 14 May 1993 16 p
(AD-A265442; NRL/MR/6723-93-7187) Avail: CASI HC A03/MF A01

A 1-D radiation hydrodynamics code is employed to model the interaction of the NIKE KrF laser with a planar CH target. Three cases are compared to demonstrate the effects of radiative preheat: (1) the hydrodynamics of the laser target interaction with a high density equation-of-state (EOS) but without radiation; (2) the inclusion of radiation production and transport using collisional radiative equilibrium for the ionization dynamics; and (3) the addition of an approximate model for the pressure ionization and continuum lowering in the ionization dynamics. These last aspects are shown to significantly affect the results due to the strongly coupled plasma state of the compressed, accelerated target. As one moves from case (1) to (3), the density gradient near the ablation front is substantially reduced, implying a decrease in the Rayleigh-Taylor instability growth rates, but at the consequence of a hot and broad accelerating target. Furthermore, the photon spectra emerging from the rearside of the target is shifted in case (3) as compared to (2) toward higher energies and away from the absorption peak of neutral DT fuel. DTIC

N93-32047# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
MICROINSTABILITIES IN HIGH-POWER MPD SYSTEMS: PRELIMINARY DIAGNOSTICS M.S. Thesis
Erik C. Bowman 9 Dec. 1992 171 p
(AD-A265415; AFIT/CI/CIA-92-137) Avail: CASI HC A08/MF A02

The saturation of microinstabilities has been theorized to cause anomalous transport in MPD thrusters. However, calculation of anomalous transport properties is an area which is still in its infancy. It is the object of this paper to discuss the importance of anomalous transport in MPD thruster operation, how microinstabilities are related to anomalous transport, the types of microinstabilities most likely to occur, and at what locations in the MPD thruster. First, preliminary measurements were made of mean plasma properties and fluctuations using imbedded probe techniques in the plume and internal locations of a MW level MPD thruster operating near, but below, global onset conditions using probe techniques. Analysis of these results as well as significant incidental results are discussed. Next, a kinetic theory method for calculating plasma transport properties in a two-temperature, multiple species, nonequilibrium plasma has been modified to account for anomalous transport. DTIC

N93-31682# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (Germany). Inst. fuer Extraterrestrische Physik.
QUASI-PARALLEL SHOCK RE-FORMATION: TWO-DIMENSIONAL SIMULATIONS
M. Scholer, M. Fujimoto (Nagoya Univ., Japan.), and H. Kucharek *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 59-63 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31683# London Univ. (England). Astronomy Unit.
ION ACCELERATION AT PARALLEL SHOCKS: SELF-CONSISTENT PLASMA SIMULATIONS
J. Giacalone, D. Burgess, and S. J. Schwartz *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 65-70 (For primary document see N93-31674 12-90)
(Grant SERC-GR/H09454)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31684*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
PLASMA WAVE PHENOMENA OBSERVED AT INTERPLANETARY SHOCKS BY THE ULYSSES URAP EXPERIMENT
D. Lengyel-Frey (Maryland Univ., College Park.), R. J. MacDowall, R. G. Stone, S. Hoang (Observatoire de Paris-Meudon, France.), F. Pantellini (Observatoire de Paris-Meudon, France.), P. Canu (Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux, France.), N. Cornilleau-Wehrlin (Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux, France.), A. Balogh (Imperial Coll. of Science and Technology, London, England.), and R. Forsyth (Imperial Coll. of Science and Technology, London, England.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 71-76 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31689# Academy of Sciences (USSR), Moscow. Space Research Inst.
ENERGETICS OF ULF/ELF PLASMA WAVES IN THE SOLAR WIND AND OUTER EARTH'S MAGNETOSPHERE
S. I. Klimov *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 95-100 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31690# Academy of Sciences (USSR), Moscow. Space Research Inst.
ULF/ELF ELECTROMAGNETIC WAVES ASSOCIATED WITH THE QUASIPERPENDICULAR EARTH'S BOW SHOCK CROSSINGS
M. N. Nozdrachev and A. A. Petrukovich *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 101-106 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31692# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (Germany). Inst. fuer Extraterrestrische Physik.
PLASMA TRANSPORT THROUGH MAGNETIC BOUNDARIES
R. A. Treumann (Dartmouth Coll., Hanover, NH.), J. LaBelle (Dartmouth Coll., Hanover, NH.), and R. Pottelette (Centre National d'Etudes des Telecommunications, Saint Maur des Fosses, France.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 115-125 Sponsored in part by Dartmouth Coll. and PROCOPE (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A03/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31697# Leningrad State Univ. (USSR). Inst. of Physics.
TIME-VARYING RECONNECTION IN A STAGNATION-POINT FLOW GEOMETRY
V. S. Semenov, B. P. Besser (Academy of Sciences, Graz, Austria.), H. K. Biernat (Academy of Sciences, Graz, Austria.), and G. A. Bachmaier (Academy of Sciences, Graz, Austria.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 161-164 Sponsored in part by Fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31714# Swedish Inst. of Space Physics, Uppsala.
PLASMA WAVES INTERFEROMETRY ON CLUSTER
G. Gustafsson and K. Stasiewicz *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 279-282 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N93-31077 Atomic Energy Commission, Damascus (Syria).
HIGH TEMPERATURE SUPERCONDUCTIVITY: CONCEPT, PREPARATION AND TESTING OF HIGH T(SUB c) SUPERCONDUCTOR COMPOUNDS AND APPLICATIONS
Wafik Harara Jun. 1992 25 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(DE93-608696; AECS-S/RSS-41) Avail: CASI HC A03 (US Sales Only)

Many studies have been carried out on high temperature superconductors with transition temperatures above that of liquid nitrogen. In this scientific study, the concept and the mechanism of this phenomena are discussed. Additionally, examples of the preparation and testing of high temperature superconductor compounds are shown. The most important applications in industry are explained. DOE

N93-31086# International Centre for Theoretical Physics, Trieste (Italy).
THE THERMODYNAMIC AND STRUCTURAL CONTRIBUTIONS TO THE VACANCY FORMATION ENERGIES IN HOT RARE GAS SOLIDS
R. I. M. A. Rashid Jul. 1992 5 p
(DE93-604742; IC-92/160) Avail: CASI HC A01/MF A01 (US Sales Only)

For the case of close-packed hot rare gas crystals, the vacancy formation energy E(sub v) is expressed in terms of thermodynamic quantities at melting temperatures and contributions from state dependent structure. It is found that in the determination of the vacancy formation energy the thermodynamic term dominates. The structural contributions can be estimated from diffraction experiments and molecular dynamic data and are shown to be insignificant compared to the contributions of thermodynamic terms in argon and krypton. However, the structural corrections for neon are found to be moderate, suggesting that the three-body effects are important in neon. DOE

N93-31098# International Centre for Theoretical Physics, Trieste (Italy).
ON THE MAGNETORESISTANCE OF HEAVY FERMION COMPOUNDS
Chengchung Lee and Chung Chen Sep. 1992 24 p
(DE93-608691; IC-92/250) Avail: CASI HC A03/MF A01 (US Sales Only)

Starting from the two-conduction-band Anderson lattice model, the magneto-transport properties of heavy fermion systems are studied in the slave boson mean field theory. The residual magnetoresistivity induced by different kinds of impurities is calculated, and the experimentally detected positive maximum structure in the residual magnetoresistance of heavy fermion systems is reproduced. The transition of field-dependent resistivity from nonmonotonic to monotonic behavior with increasing temperature can be explained naturally by including the charge fluctuation effect. The influence of applied pressure is also investigated. DOE

N93-31100# International Centre for Theoretical Physics, Trieste (Italy).
EXCITON SOLITARY WAVES IN MOLECULAR CRYSTALS
M. T. Primatarowa and K. T. Stoychev Sep. 1992 27 p
(DE93-608693; IC-92/252) Avail: CASI HC A03/MF A01 (US Sales Only)

Solitary waves formed by nonlinear intramolecular excitations (electronic or vibrational excitons) are investigated. Bell- and kin-type solutions are obtained and the conditions for their existence are determined. Effects of the exciton dispersion on the properties of the solitons in gyrotropic as well as nongyrotropic crystals are analyzed. The dispersion is shown to produce changes of the type of the solution inside the Brillouin zone, accompanied by a critical behavior of some soliton parameters. DOE

N93-31159# International Centre for Theoretical Physics, Trieste (Italy).
NUMERICAL EVIDENCE FOR TWO TYPES OF LOCALIZED STATES IN A TWO-DIMENSIONAL DISORDERED LATTICE
N. Tit and N. Kumar (Indian Inst. of Science, Bangalore.) Jun. 1992 13 p
(DE92-642677; IC-92/119) Avail: CASI HC A03/MF A01 (US Sales Only)

Results of our numerical calculations, based on the equation of motion method, of dc-electrical conductivity and of density of states up to 40x40 two-dimensional square lattices modeling a right-binding Hamiltonian for a binary (AB) compound, disordered by randomly distributed B vacancies up to 10% are reported. Our results indicate strongly localized states away from band centers separated from the relatively weakly localized states toward midband. This is in qualitative agreement with the idea of a 'mobility edge' separating exponentially localized states from the power-law localized states as suggested by the two-parameter scaling theory of Kaveh in two dimensions. DOE

N93-31163# International Centre for Theoretical Physics, Trieste (Italy).
MICROSCOPIC ORIGIN OF MARGINAL FERMI-LIQUID IN STRONGLY CORRELATED SPIN SYSTEMS
A. P. Protogenov and D. A. Ryndyk Aug. 1992 15 p
(DE93-608697; IC-92/211) Avail: CASI HC A03/MF A01 (US Sales Only)

The consequences of separation of spin and charge degrees of freedom in 2 + 1D strongly correlated spin systems are considered. Self-consistent spin and charge motions induced by doping in sites of ground and dual lattices form such a spectrum of quasiparticles which together with the dispersionless character of the collective excitation spectrum and the chemical potential pinning in the band center yield the necessary behavior of charge and spin polarizability to support the theory of marginal liquid. DOE

N93-31175# Melbourne Univ., Parkville (Australia). School of Physics.
HIERARCHICAL TEXTURES IN FERROELECTRIC CRYSTALS

Julin Peng and L. A. Bursill 1992 9 p
(DE93-608938; UM-P-92/34) Avail: CASI HC A02/MF A01 (US Sales Only)

Some results from a new study of the relaxor-like material known as PST, lead scandium tantalate Pb(Sc(0.5)Ta(0.5)O3) are presented. The emphasis is on some novel electron optical results and techniques. It will be shown that the High Resolution Transmission Electron Microscopy techniques offer a new level of understanding of the nanostructure of PST. DOE

N93-31176# Melbourne Univ., Parkville (Australia). School of Physics.
HREM STUDY OF CRYSTALLOGRAPHY OF TITANIUM AND TITANIUM HYDRIDE THIN FILMS
Y. Kasukabe, Y. Yamada (Tohoku Univ., Sendai, Japan.), and L. A. Bursill (Melbourne Univ., Parkville, Australia.) 1992 6 p
(DE93-609038; UM-P-92/33) Avail: CASI HC A02/MF A01 (US Sales Only)

The purpose of this work is to first examine the microscopic structure of evaporated Ti films on NaCl substrates using high-resolution TEM observations and then to discuss the crystallographic relationships and growth mechanism of the films. DOE

N93-31190# Westinghouse Science and Technology Center, Pittsburgh, PA.
HIGH TEMPERATURE SUPERCONDUCTING FILMS AND MULTILAYERS FOR ELECTRONICS Annual Report, 21 Feb. 1992 - 20 Feb. 1993
John R. Gavaler and John Talvacchio 20 Feb. 1993 30 p
(Contract F49620-91-C-0034)
(AD-A264410; Rept-93-9SL2-Super-R1; AFOSR-93-0264TR) Avail: CASI HC A03/MF A01

Progress is reported on four tasks which address problems fundamental to the understanding of the superconducting state in HTS films: the application of HTS films in passive microwave circuits, the realization of HTS digital electronics, and the development of new superconducting devices. An anti-correlation between critical temperature and normal state resistivity was observed at certain compositions in the YBCO, LSCO, and BKBO systems. The criticality of optimizing both oxidation steps involved in YBCO growth to obtain low RF surface resistances was demonstrated. A new insulating material, Sr-Al-Ta-O (SAT), was developed as an epitaxial insulator in multilayer YBCO circuits to replace Sr-Ti-O. The dc resistivity and surface morphology were as good as those of Sr-Ti-O while the real and imaginary parts of the dielectric constant were greatly superior. Systematic studies were made of the processing parameters for step-edge S-N-S YBCO Josephson junctions. The critical parameters for junction reproducibility were found to be a step angle of approximately 15 deg and a high-conductivity normal-metal barrier. All-BKBO tunnel junctions were demonstrated with Sr-Ti-O tunnel barriers which exhibited a superconducting gap structure to within 2K of the transition temperature of the BKBO electrodes. Epitaxial Sr-Ti-O films were also used as buffer layers to permit single-orientation BKBO films to be grown on practical La-Al-O or Nd-Ga-O substrates. DTIC

N93-31523# Technische Univ., Eindhoven (Netherlands). Dept. of Physics.
SCATTERING OF ELECTRONS AT HETEROSTRUCTURE INTERFACES Ph.D. Thesis
Johan Peter Cuypers 1992 130 p Sponsored by Netherlands Organization for Scientific Technology
(ETN-93-94044) Avail: CASI HC A07/MF A02

The description of the electronic properties of lattice matched semiconductor heterostructures is addressed. In particular the matching of electronic wavefunctions and their slowly varying envelopes at the abrupt heterostructures interfaces is investigated. The employed method is based on the use of empirical pseudopotentials with the aid of which the bandstructures of the respective layer materials can be relatively accurately reproduced. The scattering matrix method for the calculation of electronic wavefunctions in a heterostructure is outlined, and is applied to a number of examples. The theory of envelope functions in lattice matched heterostructures and the problem of connecting envelope functions at heterostructure interfaces are also addressed. ESA

N93-31619# Technische Univ., Eindhoven (Netherlands).
LIGHT-INDUCED BAND-STRUCTURE MODIFICATIONS IN MODULATION-DOPED 3-5 SEMICONDUCTOR HETEROSTRUCTURES Ph.D. Thesis
Leo Marie Weegels 1992 153 p
(ETN-93-94053) Avail: CASI HC A08/MF A02

The (non)linear optical properties of low dimensional layered semiconductors is addressed. In particular the properties of a n-type modulation doped heterostructure containing a high mobility two Dimensional Electron Gas (2DEG), which is located in a thin GaAs layer of 55 nm, are investigated by low temperature photoluminescence spectroscopy. The thickness of this GaAs layer ensures overlap of electronics in the 2DEG and photogenerated holes making photoluminescence spectroscopy possible. The specially designed modulation doped heterostructure and the experimental techniques used are described. The results on the optical properties of the heterostructure as obtained from photoluminescence spectroscopy are studied. The separation of the electrons and holes in the experiments is addressed. The results of time resolved photoluminescence experiments to study cooling and recombination behavior of carriers in the GaAs/Al(x)Ga(1-x)As modulation doped heterostructure are presented. The possibilities of the mechanism of light induced band structure modifications in modulation doped heterostructures to be employed in room temperature devices is shown. ESA

N93-31620# Technische Univ., Eindhoven (Netherlands). Dept. of Physics.
CARRIER CAPTURE IN 3-5 SEMICONDUCTOR QUANTUM WELLS Ph.D. Thesis
Paulus Wilhelmus Mar Blom 1992 117 p Sponsored by Netherlands Organization for Scientific Technology
(ETN-93-94054) Avail: CASI HC A06/MF A02

The capture of injected or photoexcited carriers into a semiconductor quantum well, a process which is expected to be relevant for the performance of quantum well lasers, is studied. The results of a theoretical study in the carrier capture process in Separate Confinement Heterostructure Quantum Well (SCHQW) structures are presented. The capture model of Brum and Bastard is extended to Multiple Quantum Well (MQW) structures and it is demonstrated that the predicted capture times for large MQW structures are very short (less than 1 ps), in agreement with the reported experimental results for precisely these structures. An ambipolar capture model in which the different capture times of electrons and holes as well as their dependence in the barrier subband population are taken into account is presented. The results of the experimental study of the carrier capture process in SCHQW structures by subpicosecond rise time measurements of the quantum well luminescence as well as by pump probe correlation measurements of the population decay in the barrier layer are shown. The relevance of the carrier capture process for the device characteristics of a quantum well laser is shown. ESA

N93-31664# International Centre for Theoretical Physics, Trieste (Italy).
ELECTRONIC LANDAU LEVELS IN QUANTUM WELLS WITH PERIODICALLY STRUCTURED INTERFACES
Hong Sun Sep. 1992 23 p
(DE93-608514; IC-92/242) Avail: CASI HC A03/MF A01 (US Sales Only)

The energy dispersions of the electronic Landau levels in GaAs/Al(x)Ga(1-x)As lateral surface superlattices (LSSL's) with periodically structured interfaces in a normally applied static magnetic field are calculated numerically. The results show that the energy dispersions of the adjacent Landau levels are out of phase, which greatly reduces the energy gaps between the adjacent energy bands. For certain interface structures, the energy gaps will disappear giving a continuous distribution of the electronic states in the energy space. The effects of the periodically structured interfaces become negligible when the periods of the structured interfaces are much less than the extension, the absolute value of Delta(x) = 2(square root of hc/eB), of the electronic wave functions in magnetic fields. The results also show that the approximation assuming an infinitely high potential barrier between the well GaAs and barrier Al(x)Ga(1-x)As is not very accurate in calculating the electronic Landau levels in LSSL's with periodically structured interfaces. The changes of the energy dispersions of the electronic Landau levels with the magnetic fields and structural parameters of LSSL's are studied in detail. DOE

N93-31804# Columbia Univ., New York, NY.
STUDY OF IMPROVED CRITICAL CURRENTS AND MECHANICAL PROPERTIES IN YBaCuO SUPERCONDUCTOR WITH Ag OR 211 Annual Report, 1 Apr. 1992 - 31 Mar. 1993
Siu-Wai Chan Apr. 1993 32 p
(Contract F49620-92-J-0160)
(AD-A265749; AFOSR-93-0385TR) Avail: CASI HC A03/MF A01

The microstructure of the melted textured bulk YBCO materials with different vol% 211 were investigated. The homogeneity of 211 distribution was greatly improved by using a solution precipitated 211 powder in preparation. Crack spacings were found to decrease with increasing vol% of the 211 particles. The 211 particles were found to be effective in holding crack propagation. Hardness and toughness measurements will be performed. The measured critical current density in high fields in epitaxial thin films of YBCO were compared with both the flux pinning and pair breaking models. This work was published Nov. 1992. High quality YBCO films were grown on spinel and garnet. These substrate materials can interface between the superconducting and semiconducting materials for novel devices. DTIC

N93-31814# Melbourne Univ., Parkville (Australia). School of Physics.
RELATIVISTIC BAND GAPS IN ONE-DIMENSIONAL DISORDERED SYSTEMS
G. J. Clerk and B. H. J. McKellar 1992 30 p
(DE93-609841; UM-P-91/103; OZ-P-92/02) Avail: CASI HC A03/MF A01 (US Sales Only)

Conditions for the existence of band gaps in a one-dimensional disordered array of (delta)-function potentials possessing short range order are developed in a relativistic framework. Both Lorentz vector and scalar type potentials are treated. The relationship between the energy gaps and the transmission properties of the array are also discussed. DOE

N93-31921# Rice Univ., Houston, TX. Dept. of Chemistry.
INVESTIGATION OF DIAMOND HOMOEPITAXY BY IN SITU FIZEAU INTERFEROMETRY: THE ROLE OF OXYGEN Technical Report No. 17
Robin E. Rawles, Carter Kittrell, and Mark P. DEvelyn 29 May 1993 9 p
(Contract N00014-91-J-1550)
(AD-A265544) Avail: CASI HC A02/MF A01

Optical Fizeau interferometry has been employed as an in situ probe of growth rate and surface morphology in diamond homoepitaxy. The spatial fringe pattern produced by interference between HeNe laser light reflected from the front and back faces of a diamond single crystal is imaged, providing a map of the local substrate thickness. Growth causes the fringe pattern to propagate laterally, enabling in situ monitoring of thickness changes as small as 10 nm. We have investigated the substrate temperature dependence of 100 diamond growth in a hot-filament reactor from 0.5% CH4 in hydrogen with and without oxygen. We obtained an apparent activation energy of 14 kcal/mol over the range 700-1000 C for a sample grown from pure methane in hydrogen. The addition of O2 to the reactant feedstock had pronounced effects on the growth kinetics: below 850 C the growth rate was enhanced whereas etching was observed above 970 C. Treatment of a polycrystalline diamond film under a hot filament with 0.25% O2 in H2 produced etching of both sp3 and sp2 carbon. DTIC

N93-31988# Lawrence Livermore National Lab., CA.
TEMPERATURE DEPENDENCE OF THE FEMTOSECOND OPTICAL RESPONSE IN DOPED HIGH TEMPERATURE SUPERCONDUCTORS
D. H. Reitze, A. M. Weiner (Purdue Univ., West Lafayette, IN.), S. Etemad (Bell Communications Research, Inc., Red Bank, NJ.), A. Inam (Bell Communications Research, Inc., Red Bank, NJ.), and G. Focht (Tennessee Technological Univ., Cookeville.) 3 Mar. 1993 14 p Presented at the Society of Photo-Optical Instrumentational Engineers (SPIE) Meeting, Las Vegas, NV, 6-23 Jan. 1993
(Contract W-7405-eng-48)
(DE93-009514; UCRL-JC-113251; CONF-930192-1) Avail: CASI HC A03/MF A01

A two-dimensional fully electromagnetic finite difference time-domain code was used to investigate the penetration of electromagnetic radiation into cavities with apertures. The study used two different temporal waveforms to compare the coupling efficiency. We found that cavity modes were excited due to the induced surface current caused by the incident radiation pulse. The fast-rise pulse, which contained higher frequency components, was found to have higher coupling efficiency. The effects of other parameters such as aperture size and amplitude of the waveform were also studied. DOE

N93-32002# Princeton Univ., NJ. Joseph Henry Lab. of Physics.
PRESSURE INDUCED TOPOLOGICAL PHASE TRANSITIONS IN MEMBRANES
P. T. So, Sol M. Gruner, and Shyamsunder Erramilli 1992 13 p
(Contract N00014-86-K-0396)
(AD-A265212) Avail: CASI HC A03/MF A01

Some highly unusual features of a lipid-water crystal are revealed by high pressure x-ray diffraction, light scattering, and dilatometric studies of the lamellar (bilayer L alpha) to nonlamellar inverse hexagonal (H sub 2) phase transition: (1) The size of the unit cell of the H (sub 2) phase increases with increasing pressure; (2) The transition volume, delta V (sub bh) decreases. Data are presented which suggest that this increase is due to the information of an intermediate cubic phase, consistent with theoretical suggestions of an underlying universal phase sequence. DTIC

N93-32045# Rice Univ., Houston, TX. Dept. of Chemistry.
PROGRESS TOWARD ATOMIC LAYER EPITAXY OF DIAMOND USING RADICAL CHEMISTRY
R. Gat, T. I. Hukka, and M. P. DEvelyn 29 May 1993 14 p
(Contract N00014-91-J-1550)
(AD-A265409) Avail: CASI HC A03/MF A01

A method for atomic layer epitaxy (ALE) of diamond using radical reactants under medium vacuum conditions is being developed. Precursor molecules are injected into a stream of thermally-dissociated fluorine atoms, generating radicals in a chemically specific way. We have grown diamond particles at rates of approximately 0.1 micrometers/hr on polycrystalline copper and nickel wire substrates seeded by diamond particles from continuous flows of F/F2, H2, and C2H3 or CH4 at substrate temperatures of 500-600 C and reactor pressures between 10(exp-3) and 10(exp-1) Torr. Identification of diamond with submicron lateral resolution was made using electron microprobe x-ray fluorescence wavelength dispersive spectroscopy. DTIC

N93-32083 Scientific Research Associates, Inc., Glastonbury, CT.
NUMERICAL STUDIES OF LOW TEMPERATURE GALLIUM ARSENIDE BUFFER LAYERS AND THEIR INFLUENCE ON DEVICE OPERATION Annual Report, 15 Jan. 1992 - 15 Jan. 1993
H. L. Grubin and J. P. Kreskovsky 14 Apr. 1993 18 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract F49620-91-C-0023)
(AD-A264296; SRA-R-93-9134-1; AFOSR-93-0286TR) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The focus of the program is the development and application of an algorithm for studying charge transport in low temperature gallium arsenide (LT-GaAs) buffer layers and the influence of such layers on device operation. During this reporting period the drift and diffusion equations were modified to include the contributions of clusters in one and two dimensions. In addition, the effects of high resistance material on the operation of FET's was begun. Specifically numerical simulations of clusters in LT-GaAs were performed in which the electrical characteristics of the clusters were modeled as local trap sites. Simulations were performed for a single cluster in one dimension, two clusters in one dimension, and an array of clusters in two dimensions. The one-dimensional simulations of a single cluster demonstrate the depletion of mobile charge around the cluster and barrier-like electrostatic behavior. Double cluster simulations, also in one dimension, show the effect of overlapping depletion regions. Two-dimensional simulations of arrays of clusters show how the interaction between the clusters results in an insulating material. Finally, a macroscopic model of the LT material is utilized in the simulation of an FET with an LT layer under the gate. The results suggest that such structures should have enhanced breakdown characteristics without adversely affecting performance. Interaction with Wright Laboratories and Lincoln Laboratories on organization of an APS-focused session on LTR materials and future directions is also summarized. DTIC

N93-32182# Pacific Northwest Lab., Richland, WA.
EFFECTS OF SURFACE DEFECTS ON THE LOCAL ELECTRIC FIELD IN INHOMOGENEOUS MEDIA
K. F. Ferris and S. M. Risser Feb. 1993 9 p Presented at the 16th Material Research Society International Symposium on the Scientific Basis for Nuclear Waste Management Fall Meeting, Boston, MA, 30 Nov. - 5 Dec. 1992
(Contract DE-AC06-76RL-01830)
(DE93-011035; PNL-SA-21238; CONF-921101-112) Avail: CASI HC A02/MF A01

Surface defects both focus the local electric field and enhance its intensity in the vicinity of the defect. Using a finite element model of an inhomogeneous dielectric film, we have examined the relationship between the defect shape and local electric field in the film and defect. We find that raised defect regions that are peaked have the largest local fields while the slope of removed regions has little effect on the field in raised defects. Both peaked and flat surface defects can lead to large enhancements of the local electric field above that predicted by effective medium approximation (EMA) methods. DOE

N93-32183# Sandia National Labs., Albuquerque, NM.
Si ATOMIC LAYER EPITAXY BASED ON Si2H6 AND REMOTE He PLASMA BOMBARDMENT
A. Mahajan, J. Irby, D. Kinosky, R. Qian, S. Thomas, S. Banerjee, A. Tasch, and T. Picraux 1993 17 p Presented at the Atomic Layer Epitaxy, Raleigh, NC, 3-5 Jun. 1992
(Contract DE-AC04-76DP-00789)
(DE93-011674; SAND-93-0864C; CONF-920690-1) Avail: CASI HC A03/MF A01

We have demonstrated removal of H from a H-passivated Si(100) surface by low energy (approximately 50 eV) He ion bombardment. The extent of the removal of H from the surface can be controlled by varying the duration of He bombardment and plasma parameters. This, in turn, means that the growth rate by this method can also be controlled. Si2H6 was shown to adsorb in a self-limiting manner on the Si(100) surface. DOE

N93-32206 Department of the Navy, Washington, DC.
METHOD AND APPARATUS FOR CHARACTERIZING THE QUALITY FOR ELECTRICALLY THIN SEMICONDUCTOR FILMS Patent
Mark L. Burgener, inventor (to Navy), Graham A. Garcia, inventor (to Navy), and Ronald E. Reedy, inventor (to Navy) 23 Mar. 1993 52 p Filed 23 Apr. 1990
(AD-D015734; US-Patent-5,196,802; US-Patent-Appl-SN-516492; US-Patent-Class-324-663) Avail: US Patent and Trademark Office

A method and apparatus for characterizing the quality of an electrically thin semiconductor film and its interfaces with adjacent materials by employing a capacitor and a topside electrical contact on the same side of the electrically thin semiconductor film to thereby permit the taking of capacitance-voltage (C-V) measurements is described. A computer controlled C-V measuring system is operatively coupled to the contact and capacitor to modulate the potential on the capacitor. Variation of the voltage applied to the capacitor enables modulation of the potential applied to the film to thereby vary the conductivity of the film between the capacitor gate node and the topside contact. DTIC

N93-32211 Department of the Navy, Washington, DC.
LIQUID-CRYSTAL HEAT VALVE CONTROLLED WITH MULTIPLE ELECTRODE PAIRS Patent
Michael E. Stefanov, inventor (to Navy), Rand R. Biggers, inventor (to Navy), Jeff W. Rish, III, inventor (to Navy), Girardeau L. Henderson, inventor (to Navy), and Chuong N. Pham, inventor (to Navy) 23 Feb. 1993 4 p Filed 22 Jun. 1992
(AD-D015739; US-Patent-5,188,171; US-Patent-Appl-SN-902201; US-Patent-Class-165-96) Avail: US Patent and Trademark Office

A liquid-crystal heat valve is constructed to be controlled with multiple electrode pairs. So constructed, it is controllable by alternating electric potentials in different phases applied to corresponding electrode pairs, thus increasing the maximum heat-transfer rate of the heat valve by increasing its duty cycle. DTIC

N93-32280# International Centre for Theoretical Physics, Trieste (Italy).
ON THE SUPERCONDUCTIVITY EXISTENCE WITHIN THE HUBBARD MODEL
Anh Tuan Hoang, Toan Thang Nguyen, and Ngoc Thuan Nguyen Sep. 1992 10 p
(DE93-613987; IC-92/277) Avail: CASI HC A02/MF A01 (US Sales Only)

The Hubbard model is considered within the framework of the new functional integral method suggested by Sarker. A dynamical system of equations determining the superconducting phase of the Hubbard model is derived. DOE

N93-32405# Instituto de Fisica Teorica, Sao Paulo (Brazil).
BCS UNIVERSAL CONSTANTS FOR HIGH-TEMPERATURE SUPERCONDUCTIVITY
V. C. Aguilera-Navarro and M. deLlano (North Dakota State Univ., Fargo.) Oct. 1991 15 p
(DE92-642079; IFT-P-038/91) Avail: CASI HC A03/MF A01 (US Sales Only)

Weak-coupling BCS superconductivity theory is shown to admit a more general T(sub c) formula wherein T(sub c) approaches zero somewhat faster than with the BCS T(sub c) formula. This allows some recent empirical values for ceramic superconductors of the gap-to-T(sub c) ratio smaller than the universal BCS value of 3.53 not to be inconsistent with weak electron-boson coupling. Similarly, other universal constants related to specific heat and critical magnetic field will be modified. DOE

N93-31560*# Cincinnati Univ., OH.
AN INTEGRATED EDDY CURRENT DETECTION AND IMAGING SYSTEM ON A SILICON CHIP
H. Thurman Henderson, K. P. Kartalia, and Joseph D. Dury *In* NASA. Lewis Research Center, Structural Integrity and Durability of Reusable Space Propulsion Systems May 1991 p 51-61 (For primary document see N93-31552 12-20)
Avail: CASI HC A03/MF A03

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N93-31075# International Centre for Theoretical Physics, Trieste (Italy).
STRING-LIKE EXCITATIONS IN QUANTUM ELECTRODYNAMICS
L. V. Prokhorov (Saint Petersburg Technical Univ., Russia.), D. V. Fursaev, and S. V. Shabanov (Joint Inst. for Nuclear Research, Moscow, USSR.) Jun. 1992 20 p
(DE92-642593; IC-92/116) Avail: CASI HC A03/MF A01 (US Sales Only)

The evolution of string-like excitations of a gauge field (exponential contour integrals) in the free quantum electrodynamics (QED) and in electrodynamics with static sources is investigated. It is shown that these excitations are not stable and after radiating of a surplus energy turn into the field of Coulomb sources. The results are compared with calculations in the lattice quantum electrodynamics. It is also shown that the strong coupling method is not suitable for solving the confinement problem in this case. DOE

N93-31121# Groningen Rijksuniv. (Netherlands). Kernfysisch Versneller Inst.
RELATIVISTIC TRANSPORT THEORY
R. Malfliet 1992 9 p Presented at 1992 International Nulcear Physics Conference, Wiesbaden, Germany, 26 Jul. - 1 Aug. 1992
(KVI-952; ETN-93-94083) Avail: CASI HC A02/MF A01

The present status of relativistic transport theory is discussed. Special emphasis is put on problems of topical interest: hadronic features, thermodynamical consistent approximations and spectral properties. The analysis shows that the formal development of relativistic transport models

is well known, and that the development of practical relativistic transport models is in its early stages. Moreover, the calculations for purely nucleonic systems combine a mean field based on the sigma-omega model and usually on ad hoc construction for the collision term. They use the quasi particle approximation and project on positive energy spinors only. A number of the major challenges to be solved in the future are listed. ESA

N93-31122# Nationaal Inst. voor Kernfysica en Hoge Energiefysica, Amsterdam (Netherlands).
BRST QUANTIZATION OF 2D-YANG MILLS THEORY WITH ANOMALIES
Wolfgang Kalau 9 Sep. 1992 26 p
(NIKHEF-H/92-13; ETN-93-94084) Avail: CASI HC A03/MF A01

The BRST quantization of anomalous two dimensional (2D) Yang Mills (YM) theory is discussed. Since an oscillator basis for the YM Fock space is used, the anomaly appears already for a pure YM system and the constraints form a Kac-Moody algebra with negative central charge. The coupling of chiral fermions is discussed and it is found that the BRST cohomology for systems with chiral fermions in a sufficiently large representation of the gauge group is completely equivalent to the cohomology of the finite dimensional gauge group. For pure YM theory or YM theory coupled to chiral fermions in small representations there exists an infinite number of inequivalent cohomology classes. This is discussed in detail for the example of SU(2). ESA

N93-31129 Indiana Univ., Bloomington.
QUANTUM SPECTRA AND DYNAMICS Ph.D. Thesis
Julio Cesar Arce 1992 244 p
Avail: Univ. Microfilms Order No. DA9310311

This work focuses on time-dependent quantum theory and methods for the study of the spectra and dynamics of atomic and molecular systems. Specifically, we have addressed the following two problems: (1) Development of a time-dependent spectral method for the construction of spectra of simple quantum systems. This includes the calculation of eigenenergies, the construction of bound and continuum eigenfunctions, and the calculation of photo cross-sections. Computational applications include the quadrupole photoabsorption spectra and dissociation cross-sections of molecular hydrogen from various vibrational states in its ground electronic potential-energy curve. This method is seen to provide an advantageous alternative, both from the computational and conceptual point of view, to existing standard methods. (2) Explicit time-dependent formulation of photoabsorption processes -- Analytical solutions of the time-dependent Schrodinger equation are constructed and employed for the calculation of probability densities, momentum distributions, fluxes, transition rates, expectation values and correlation functions. These quantities are seen to establish the link between the dynamics and the calculated, or measured, spectra and cross-sections, and to clarify the dynamical nature of the excitation, transition and ejection processes. Numerical calculations on atomic and molecular hydrogen corroborate and complement the previous results, allowing the identification of different regimes during the photoabsorption process. Dissert. Abstr.

N93-31226# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Physics.
QUANTUM ADIABATIC EXPANSION FOR DYNAMICS IN STRONG MAGNETIC FIELDS
Anatoli Entelis and Shimon Levit May 1992 8 p
(DE93-609388; WIS-PH-92-39) Avail: CASI HC A02/MF A01 (US Sales Only)

In description of motion in a uniform strong magnetic field in the presence of external potentials, the velocities of the cyclotron rotation and the guiding center coordinates are respectively fast and slow variables. A quantum adiabatic expansion was developed for this situation. In the adiabatic limit it was found that effective action of the slow variables in which the energy 'surfaces' are local Landau levels depending on the coordinates of the guiding centers. The levels are not equidistant and may exhibit avoided crossings at which the transitions between the levels are concentrated. The action includes additional terms arising from Berry phase. These terms modify the simplectic form of the dynamics of the guiding centers and effect the Wentzel-Kramer-Brillouin (WKB) quantization. As a result it has a form of flux quantization through closed classical orbit of an effective magnetic field which in addition to the original field includes inhomogeneous terms arising from the Berry phase and depending on the external potential. Explicit calculations for the potentials which are weakly inhomogeneous on the scale of the magnetic length are presented. The standard strong field projection on a single Landau level is the first term of our expansion. DOE

N93-31287# International Centre for Theoretical Physics, Trieste (Italy).
INFORMATION-THEORETIC OUTLOOK OF THE QUANTUM DISSIPATION PROBLEM
A. M. Kowalski (Buenos Aires Univ., Argentina.), A. Plastino (Buenos Aires Univ., Argentina.), and A. N. Proto Aug. 1992 20 p
(DE93-608162; IC-92/214) Avail: CASI HC A03/MF A01 (US Sales Only)

The interaction between two harmonic oscillators, a classical and a quantum one, coupled through a linear term, is analyzed by recourse to the generalized Ehrenfest theorem. The model is able to mimic dissipating behavior for the quantum oscillator without violation of any quantum rule. DOE

N93-31302# International Centre for Theoretical Physics, Trieste (Italy).
INSTABILITIES AND NONSTATISTICAL BEHAVIOR IN GLOBALLY COUPLED SYSTEMS
G. Perez and H. A. Cerdeira Aug. 1992 24 p
(DE93-608185; IC-92/208) Avail: CASI HC A03/MF A01 (US Sales Only)

The mean field in a globally coupled system of chaotic logistic maps does not obey the standard rules of statistics, even for systems of very large sizes. This indicates the existence of intrinsic instabilities in its evolution. These instabilities are related to the very non-smooth behavior of mean values in a single logistic map, as a function of its parameter. Problems of this kind do not affect a similar system of coupled tent maps, where good statistical behavior was found. The transition between these two regimes is also explored. DOE

N93-31509# International Centre for Theoretical Physics, Trieste (Italy).
THE CONSTRAINT FOR THE LOWEST LANDAU LEVEL AND THE EFFECTIVE FIELD THEORY APPROACH FOR THE FRACTIONAL QUANTUM HALL SYSTEM
Zhong-Shui Ma (Academia Sinica, Beijing, China.) and Zhao-Bin Su (Academia Sinica, Beijing, China.) Sep. 1992 13 p
(DE93-608200; IC-92/248) Avail: CASI HC A03/MF A01 (US Sales Only)

By applying the Dirac quantization method, the constraint that all electrons are in the lowest Landau level is built into the Chern-Simons field theory approach for the fractional quantum Hall system and it is shown that the constraint can be transmuted from hierarchy to hierarchy. For a finite system, it is derived that the action for each hierarchy can be split into two parts: a surface part provides the action for the edge excitations while the remaining part is precisely the bulk action for the next hierarchy. The action for the edge could be decoupled from the bulk only at the hierarchy filling. DOE

N93-31621# Technische Univ., Eindhoven (Netherlands).
COULOMB-BLOCKADE OSCILLATIONS IN QUANTUM DOTS AND WIRES Ph.D. Thesis
Antonius Adriaan Mar Staring 1992 130 p
(ETN-93-94055) Avail: CASI HC A07/MF A02

The basic concepts of Coulomb blockade oscillations in quantum dots and wires are introduced and a theory for Coulomb blockade oscillations in quantum dots is summarized. The periodicity of the oscillations at zero temperature is derived from equilibrium properties of the system, and a discussion of limiting cases of the general result of a kinetic theory for transport through the dot at finite temperatures is given. These consist of the classical limit, in which the energy spectrum of the dot can be treated as a continuum (as in metals), and the quantum limit, in which transport proceeds by resonant tunneling through a single discrete energy level in the dot. In addition, Coulomb blockage oscillations in the 'thermopower' of a quantum dot are discussed. In contrast to the conductance oscillations, which consists of a series of sharp peaks, the thermopower oscillations have a sawtooth line shape. ESA

N93-31663# International Centre for Theoretical Physics, Trieste (Italy).
RADIATIVE ELECTROWEAK BREAKING AND SPARTICLE SPECTROSCOPY WITH TAN(BETA) IS APPROXIMATELY EQUAL TO (m(SUB t)) DIVIDED BY (m(SUB b))
B. Ananthanarayan, Q. Shafi, and G. Lazarides (Aristotle Univ. of Thessaloniki, Greece.) Aug. 1992 17 p
(DE93-608399; IC-92/199; BA-92-29; PRL-TH-92/16) Avail: CASI HC A03/MF A01 (US Sales Only)

Radiative electroweak breaking and the related issue of sparticle spectroscopy within a N=1 supergravity framework in which the Yukawa couplings h(sub t), h(sub b), and h(sub tau) are unified at the GUT scale are explored. The parameter tan(beta) of the minimal supersymmetric standard model (MSSM) is constrained to lie close to (m(sub t))/m(sub b) is much greater than 1. With m(sub t)(m(sub t)) greater than or approximately 130 GeV, analysis based on the renormalization group improved tree level potential shows that in order to achieve a satisfactory radiative breaking, the universal gaugino mass M(sub 1/2) is greater than or approx. 450 GeV. An upper bound on M(sub 1/2) of approximately 1250 GeV is obtained from cosmological considerations. This enables us to provide both lower and upper bounds on the sparticle masses of the MSSM. For 130 GeV less than or approx. m(sub t)(m(sub t)) less than or approximately 160 GeV, the lightest supersymmetric particle, essentially the bino, lies in the range 200 GeV less than or approximately m(sub LSP) less than or approximately 550 GeV. The heaviest sparticles include the gluino (1 TeV less than or approximately m(sub g) less than or approximately 3.0 TeV) and the quarks of the first two families which typically are about 10-20% heavier. DOE

N93-31807# International Centre for Theoretical Physics, Trieste (Italy).
THREE LECTURES ON QUANTUM GROUPS: REPRESENTATIONS, DUALITY, REAL FORMS
V. K. Dobrev Jul. 1992 34 p
(DE93-608159; IC-92/178) Avail: CASI HC A03/MF A01 (US Sales Only)

Quantum groups appeared first as quantum algebra, i.e. as one parameter deformations of the numerical enveloping algebras of complex Lie algebras, in the study of the algebraic aspects of quantum integrable systems. Then quantum algebras related to triparametric solutions of the quantum Yang-Baxter equation were axiomatically introduced as (pseudo) quasi-triangular Hopf algebras. Later, a theory of formal deformations was developed and the notion of quasi-Hopf algebra was introduced. In other approaches to quantum groups the objects are called quantum matrix groups and are Hopf algebras in chirality to the quantum algebras. The representations of U(sub q)(G), the chirality and the real forms associated to these approaches are discussed. DOE

N93-31809# International Centre for Theoretical Physics, Trieste (Italy).
LEPTON-QUARK FAMILIES, COSMIC STRINGS AND DEMOCRATIC MASS MATRIX
M. Koca Aug. 1992 7 p
(DE93-608263; IC-92/213) Avail: CASI HC A02/MF A01 (US Sales Only)

A model is proposed where SU(2)(sub L) x SU(2)(subR) x U(1) electroweak symmetry is spontaneously broken to SU(2)(sub L) x U(1)(sub Y) x T', T' being the binary tetrahedral group of order 24. Irreducible representations of T' consisting of three doublets and three singlets are used to distinguish the family structure. Cosmic strings, formed by the symmetry breaking mechanism, distinguish the family members above the usual electroweak scale. Natural correspondence of the irreducible representations of T' with the modes of the Dynkin diagram of E-circumflex(sub 6) induces an S(sub 3) symmetry on the Yukawa couplings leading to 'democratic' mass matrix. For no room is left for the fundamental Higgs phi(2,2) a dynamical symmetry breaking via t-bar t and b-bar b condensates is invoked. DOE

N93-31908# Universidade Estadual de Campinas (Brazil). Inst. de Matematica, Estatistica e Ciencia da Computacao.
FREE MAXWELL EQUATIONS, DIRAC EQUATION, AND NON-DISPERSIVE DE BROGLIE WAVE PACKETS
W. A. Rodrigues, Jr., J. Vaz, Jr., and E. Recami Aug. 1992 17 p
(DE93-609848; UNICAMP-IMECC-RP-29/92) Avail: CASI HC A03/MF A01 (US Sales Only)

It is shown that some elements of de Broglie's double solution theory seem to arise rather naturally from the equivalence between the free Maxwell equations and a non-linear Heisenberg-like spinor equation. Such an equivalence is proved, in the Clifford bundle formalism by making recourse to the Rainich-Misner-Wheeler theorem. DOE

N93-31909# Melbourne Univ., Parkville (Australia). School of Physics.
WAVEFRONT RECONSTRUCTION FROM THREE DIMENSIONAL INTENSITY MEASUREMENTS
K. A. Nugent and A. Roberts 1992 10 p
(DE93-609881; UM-P-92/58) Avail: CASI HC A02/MF A01 (US Sales Only)

It is shown that it is possible to use intensity measurements taken in a series of planes perpendicular to some axis to produce full four-dimensional information about the cross spectral density function. This measurement of the intensity in any given plane gives a series of slices through the four-dimensional Fourier transform of the brightness function. For a coherent field, this information also enables us to calculate the phase and amplitude of the electric field in any given plane. If a finite measurement range is taken, the resolution of the reconstructed field is degraded, but in the limit of measurements taken over an infinite range, the full Fresnel field can be calculated. When considering the practical application of this technique to real data, the delta function definition needs to be redefined in terms of a 'top-hat' function. This does not alter any of the central conclusions obtained using delta functions, but enables the production of an algorithm for the reconstruction of the electric field from real intensity measurements. This was applied to a simulation of the simple case of a Gaussian beam. The reconstructed phase and amplitude of the electric field so obtained were in good agreement with assumed values. DOE

N93-31911# Melbourne Univ., Carlton (Australia). School of Physics.
A UNIVERSAL MASS IN (2+1)-DIMENSIONS
N. J. Cornish and N. E. Frankel 1992 12 p
(DE93-609888; UM-P-92/20) Avail: CASI HC A03/MF A01 (US Sales Only)

By combining Einstein's field equations in an unconventional way, and invoking the reasonable energy hypothesis, it was proved that all extended structures in hydrostatic equilibrium have the same maximal mass and produce spacetime that are asymptotically cylindrical when local curvature is present. DOE

N93-31914# Melbourne Univ., Parkville (Australia). School of Physics.
SCALAR SYMMETRY OF THE MASSLESS DIRAC EQUATION
G. J. Clerk and B. H. J. McKellar 1992 8 p
(DE93-609921; UM-P-92/04; OZ-P-92/03) Avail: CASI HC A02/MF A01 (US Sales Only)

The existence of a symmetry of the Dirac equation for a massless particle in a scalar field is demonstrated, and its effect on the band structure of certain arrays of scalar delta-function potentials is investigated. The implications of the symmetry for more general scalar potentials are also discussed. DOE

N93-32025# Universidade Estadual de Paulista, Sao Paulo (Brazil). Instituto de Fisica Teorica.
HELICITY AMPLITUDES FOR MATTER-COUPLED GRAVITY
R. Aldrovandi, S. F. Novaes, and D. Spehler Jul. 1992 24 p
(DE93-609932; IFT-P-027/92) Avail: CASI HC A03/MF A01 (US Sales Only)

The Weyl-van der Waerden spinor formalism is applied to the evaluation of helicity invariant amplitudes in the framework of linearized gravitation. The graviton couplings to spin-0, 1/2, 1, and 3/2 particles are given, and, to exhibit the reach of this method, the helicity amplitudes for the process electron + positron yields photon + graviton are obtained. DOE

N93-32072# Notre Dame Univ., IN. Dept. of Electrical Engineering.
QUANTUM TRANSPORT Annual Report, 15 Mar. 1992 - 14 Mar. 1993
Craig S. Lent, Wolfgang Porod, Supriyo Bandyopadhyay, and Gary H. Bernstein 14 May 1993 431 p
(Grant AF-AFOSR-0211-91)
(AD-A264935; AFOSR-93-0355TR) Avail: CASI HC A19/MF A04

During the period April 15, 1992 to April 14, 1993, research carried out by the Nanostructures Group in the Department of Electrical Engineering

at Notre Dame was concerned with a variety of quantum transport in mesoscopic structures. This research was funded by the Air Force Office of Scientific Research under Grant No. AFOSR-91-0211. The major issues examined included quantum transport in high magnetic fields and modulated channels. Coulomb-coupled quantum dot systems, transmission resonances and zeroes in resonant transport, self-consistent Hartree calculations of transport, lateral quantum wires and pn-junction formation, quantum magnetotransport in disordered systems, magnetoelectric states in quantum wires, anomalous magnetoresistance, electromigration, collision retardation and phonon effects in hot-electron transport, spin-polarized single electronics, single-particle lifetimes in quasi-1D structures, quantum transport experiments in metals, the mesoscopic photovoltaic effect, and new techniques for fabricating quantum structures in semiconductors. DTIC

N93-32181# Stanford Research Inst., Menlo Park, CA.
NOVEL SPIN EFFECTS IN QUANTUM CHROMODYNAMICS
S. J. Brodsky Feb. 1993 12 p Presented at the 10th International Symposium on High-Energy Spin Physics, Nagoya, Japan, 9-14 Nov. 1992
(Contract DE-AC03-76SF-00515)
(DE93-010955; SLAC-PUB-6068; CONF-921131-10) Avail: CASI HC A03/MF A01

This report discusses a number of interesting hadronic spin effects which test fundamental features of perturbative and non-perturbative QCD. These include constraints on the shape and normalization of the polarized quark and gluon structure functions of the proton; the principle of hadron helicity retention in high x(sub F) inclusive reactions; predictions based on total hadron helicity conservation in high momentum transfer exclusive reactions; the dependence of nuclear structure functions and shadowing on virtual photon polarization; and general constraints on the magnetic moment of hadrons. I also will discuss the implications of several measurements which are in striking conflict with leading-twist perturbative QCD predictions, such as the extraordinarily large spin correlation A(sub NN) observed in large angle proton-proton scattering, the anomalously large (rho)(pi) branching ratio of the J/(psi), and the rapidly changing polarization dependence of both J/(psi) and continuum lepton pair hadroproduction observed at large x(sub F). DOE

N93-32290# Stevens Inst. of Tech., Hoboken, NJ.
INVESTIGATION OF TRANSITIONS FROM ORDER TO CHAOS IN DYNAMICAL SYSTEMS
1992 16 p
(Contract DE-FG02-87ER-13740)
(DE93-014437; DOE/ER-13740/10) Avail: CASI HC A03/MF A01

This report briefly discusses the following areas of chaotic systems: numerical investigations of the fast dynamo problem for stationary space-periodic flows with chaotic streamlines; analytical and numerical investigations of magnetic field generation by conducting flows with finite resistivity; and emittance growth in charged particle beams. DOE

N93-32411# Melbourne Univ., Parkville (Australia). School of Physics.
A UNIFIED APPROACH TO CLASSICAL AND QUANTUM PHYSICS
J. W. G. Wignall 14 May 1991 24 p
(DE93-609843; UM-P-91/39) Avail: CASI HC A03/MF A01 (US Sales Only)

A non-mathematical account of a theory in which particles are pictured not as points but as spatially extended periodic disturbances in a classical background field - objects which vary in form and size according to the interactions they encounter and which, in particular, abruptly collapse to much smaller disturbances when they are detected. This quasi-classical theory treats the classical and quantum domains on the same fundamental footing. It is shown that, when the particle sizes are small compared with their separations, they must satisfy classical laws such as Newton's equations of motion and Maxwell's electrodynamics, but when a particle is close to, or overlaps, the source of interaction its time evolution is given by quantum formula such as the Schroedinger equation. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N93-31328# National Science Foundation, Washington, DC.
FOREIGN PARTICIPATION IN US ACADEMIC SCIENCE AND ENGINEERING: 1991 Special Report
J. G. Huckenpoehler 1993 134 p See also PB82-262452
(PB93-186583; NSF-93-302) Avail: CASI HC A07/MF A02

The report presents data on changes in the distribution of foreign students and the effect of these changes on American graduate scientific and engineering programs, and concludes with data on foreign members of the American scientific and engineering community. NTIS

N93-31507# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
AN ANNOTATED BIBLIOGRAPHY OF INDUCTIVE LEARNING SINCE 1985
G. J. Akkerman 1992 38 p Sponsored by Netherlands Organization for Scientific Research
(Rept-92-74; ETN-93-94266) Copyright Avail: CASI HC A03/MF A01

A number of articles on computational learning are considered. The articles are classified into the following groups: efficient learning theory, in which the complexity of learning is considered important, and is preferably polynomial; inductive logic programming, in which logic programs are inferred from examples; applied learning, containing the few applied articles; general learning theory, containing both recursion theoretical analysis of learning, and other material that is either theoretical or procedural but inefficient. A discussion on how the knowledge collected in this literature study can be used is given. ESA

N93-31543# Technische Univ., Eindhoven (Netherlands).
MAN, TECHNOLOGY, SOCIETY AND DEVELOPMENT: FROM THE HUNTERS AND GATHERERS TO THE FIRST INDUSTRIAL REVOLUTION 3.5 MILLION YEARS AGO INTO AD1760 Ph.D. Thesis
Paul Ernst Lapperre 1992 486 p
(ISBN-9-03-860102-6; ETN-93-94046) Copyright Avail: CASI HC A21/MF A04

A study to describe the nature and course of the global, long term, social development process, to identify key variables in this process, to analyze their role, and to determine in which ways they interrelate is presented. The following conclusions are summarized: global, long term, social development is progressively cumulative, is unilinear, runs a course of expansion of scale, is a dominantly exogenous process, is dominantly deterministic, and is discontinuous; local and regional, short term, social development is multilinear; the prime movers in the global, long term, social development process are the physical and social environment, social structure, culture, and social institutions and their distinguishing elements. ESA

N93-32229*# Hampton Univ., VA.
THE 1992 LANGLEY AEROSPACE RESEARCH SUMMER SCHOLARS (LARSS) PROGRAM Final Report
2 Jul. 1993 96 p
(Contract NCC1-166)
(NASA-CR-193371; NAS 1.26:193371) Avail: CASI HC A05/MF A01

The overwhelming majority of the LARSS participants rated their overall summer research experience as good or excellent. Even though the 1992 LARSS Program has met its goals, all areas of the program need to be considered for continuous improvement. Of the various recommendations provided by the participants, the following will be implemented in the 1993 LARSS Program: (1) LARSS participants will be housed in two or three apartment complexes; (2) mentors will be encouraged to contact their student before the beginning of the LARSS Program; (3) LARSS participants will be notified of a tentative payroll schedule before the Program begins; (4) LARSS participants will be strongly encouraged to give an oral presentation on their research project in their respective Divisions; and (5) a Career Conference, in conjunction with a forum where the participants can share their individual research projects will be held. The participant recommendations made in the 1992 LARSS Student Exit Survey will ensure a more successful and improved LARSS Program in 1993. Author

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N93-31431 National Inst. of Standards and Technology, Gaithersburg, MD. Computer Systems Lab.

MANUAL FOR DATA ADMINISTRATION Special Publication

J. J. Newton, ed. and D. C. Wahl, ed. (Vector Research, Inc., Arlington, VA.) Mar. 1993 160 p See also PB90-147919 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(PB93-182053; NIST/SP-500/208) Avail: Issuing Activity (National Technical Information Service (NTIS)); SOD HC

Data Administration is emerging as an independent discipline. Its fundamental objectives are to maximize the value, quality and usability of data resources. Data Administrators address Data Standardization, Automated Tools, Data Security, Repository Management and Strategic Data Planning. The manual is the result of two years' efforts by the National Capital Region Data Administration Management Association (NCR-DAMA) Standards and Procedures Working Group. It includes an extensive bibliography. NTIS

N93-31433# Small Business Administration, Washington, DC. Office of Advocacy.

STATES AND SMALL BUSINESS: A DIRECTORY OF PROGRAMS AND ACTIVITIES, 1993 EDITION

1993 470 p See also PB90-196353

(PB93-186427; ISBN-0-16-041654-X) Avail: CASI HC A20/MF A04

The directory is designed to identify state and local programs, agencies, laws, and other activities that aid in the nurturing of small business in the United States. Information is included for all 50 states, as well as the District of Columbia, Puerto Rico, and the U.S. Virgin Islands. The directory listings for each state are divided into five broad categories: Small Business Offices, Programs, and Activities; Governor's Advisory Council or Task Force; Legislative Committees and Subcommittees; Legislation; State Small Business Conferences. NTIS

N93-31510# Technische Univ., Eindhoven (Netherlands). Dept. of Mathematics and Computing Science.

JOB SHOP SCHEDULING BY LOCAL SEARCH

E. H. L. Aarts (Philips Gloeilampenfabrieken N.V., Eindhoven, Netherlands.), P. J. M. vanLaarhoven (McKinsey and Co., Inc., Amsterdam, Netherlands.), J. K. Lenstra (Center for Mathematics and Computer Science, Amsterdam, Netherlands.), and N. L. J. Ulder (Oce Nederland B.V., Venlo.) Jul. 1992 17 p

(Memo-COSOR-92-29; ETN-93-93185) Avail: CASI HC A03/MF A01

A computational performance analysis of local search algorithms for job shop scheduling is presented. The algorithms under investigation are iterative improvement, simulated annealing, threshold accepting, and genetic local search. The study shows that simulated annealing performs best in the sense that it finds better solutions than the other algorithms within the same amount of running time. Compared to more tailored algorithms, simulated annealing still finds the best results but only under the assumption that running time is of no concern. ESA

N93-31518# Technische Univ., Eindhoven (Netherlands).

COORDINATION OF PRODUCTION AND SALES Ph.D. Thesis

Paul Adriaan Konijnendijk 1992 223 p

(ETN-93-94039) Avail: CASI HC A10/MF A03

The relationship between production and sales in industrial production companies is studied as a result of conflicts and coordination problems signalled in practice and in the literature. Typical problem symptoms are long and unreliable lead times, high inventory levels and low customer service levels. This study is directed at the development of a framework to describe coordination requirements and possibilities for production and sales in industrial production companies. Based on such a framework both practitioners and scientists can analyze and develop coordination systems. ESA

N93-31589*# National Aeronautics and Space Administration, Washington, DC.

SCIENCE INFORMATION SYSTEMS NEWSLETTER, ISSUE 28

Apr. 1993 44 p

(NASA-TM-108266; NAS 1.15:108266) Avail: CASI HC A03/MF A01

The purpose of the Information Systems Newsletter is to inform the space science and applications research community about information systems development and to promote coordination and collaboration by providing a forum for communication. This quarterly publication focuses on programs sponsored by the Information Systems Branch in support of NASA's Office of Space Science. Articles of interest for other programs and agencies are presented as well. The April 1993 issue is presented. Derived from text

N93-31644*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

HITCHHIKER: CUSTOMER ACCOMMODATIONS AND REQUIREMENTS SPECIFICATIONS (CARS)

1992 315 p

(NASA-TM-109225; NAS 1.15:109225; HHG-730-1503-06) Avail: CASI HC A14/MF A03

In 1984, NASA Headquarters established projects at the Goddard Space Flight Center (GSFC) and the Marshall Space Flight Center (MSFC) to develop quick-reaction carrier systems for low-cost 'flight of opportunity' or secondary payloads on the Space Transportation System (STS). One of these projects is the Hitchhiker (HH) Program. GSFC has developed a family of carrier equipment known as the Shuttle Payload of Opportunity Carrier (SPOC) system for mounting small payloads such as HH to the side of the Orbiter payload bay. The side-mounted HHs are referred to as Hitchhiker-G (HH-G). MSFC developed a cross-bay 'bridge-type' carrier structure called the Hitchhiker-M (HH-M). In 1987, responsibility for the HH-M carrier was transferred to and is now managed by the HH Project Office at the GSFC. The HH-M carrier now uses the same interchangeable SPOC avionics unit and the same electrical interfaces and services developed for HH-G. National Aeronautics and Space Administration (NASA) has created this document to acquaint potential HH system customers with the facilities NASA provides and the requirements which customers must satisfy to use these facilities. This publication defines interface items required for integrating customer equipment with the HH carrier system. Those items such as mounting equipment and electrical inputs and outputs; configuration, environmental, command, telemetry, and operational constraints are described as well as weight, power, and communications. The purpose of this publication is to help the customer understand essential integration documentation requirements and to prepare a Customer Payload Requirements (CPR) document. Derived from text

N93-32311# Institute for Defense Analyses, Alexandria, VA.

STRATEGIC MANAGEMENT: MANAGING CHANGE BY MANAGING PARTICIPATION Final Report

Paul H. Richanbach and Frederick R. Riddell May 1993 15 p

(AD-A265796; IDA-D-1356; IDA/HQ-93-43856) Avail: CASI HC A03/MF A01

Strategic management seeks to link strategic planning with decision making and the implementation of decisions. The role of participation--who should participate and how that participation should be managed--is central to effective decision making. This paper discusses the importance of participation in decision making generally and shows how participatory management principles apply to the strategic management process specifically. Strategic management consists of three important steps: creating a documented plan, making strategic planning a dynamic part of the management systems, and properly managing participation in the planning process. It requires that an organization's key managers participate in a process to identify objectives, develop strategies and implementation plans to achieve those objectives, and periodically review the implementation of decisions. The process of decision making, implementation, feedback, and review is a continuous one. Practically speaking, effective decision making and implementation means assembling the right mix of people, convincing them that what they are doing is important to the senior executive, and managing their participation in the decision making process effectively. The methods described in this paper, although not a recipe for success, provide some proven techniques that will be of value to many organizations. DTIC

N93-32128*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
GENERATION AND EXPLORATION OF AGGREGATION ABSTRACTIONS FOR SCHEDULING AND RESOURCE ALLOCATION Abstract only
Michael R. Lowry and Theodore A. Linden (Advanced Decision Systems, Mountain View, CA.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 238 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

N93-32129*# Ambassador Coll., Big Sandy, TX. Computer Information Systems Dept.
PROTOCOLS FOR DISTRIBUTIVE SCHEDULING
Stephen F. Richards and Barry Fox (McDonnell-Douglas Space Systems Co., Houston, TX.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 239-249 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

N93-32130*# Honeywell, Inc., Minneapolis, MN.
SCHEDULING WITH PARTIAL ORDERS AND A CAUSAL MODEL
Mark Boddy, Jim Carciofini, and George D. Hadden *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 251-258 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32131*# Air Force Systems Command, Griffiss AFB, NY. Rome Lab.
CRISIS ACTION PLANNING AND REPLANNING USING SIPE-2
Jennifer D. Skidmore *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 259-264 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32132*# Air Force Systems Command, Griffiss AFB, NY. Rome Lab.
COMBINING QUALITATIVE AND QUANTITATIVE SPATIAL AND TEMPORAL INFORMATION IN A HIERARCHICAL STRUCTURE: APPROXIMATE REASONING FOR PLAN EXECUTION MONITORING
Louis J. Hoebel *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 265-274 Prepared in cooperation with Rochester Univ., NY (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32133*# Carnegie-Mellon Univ., Pittsburgh, PA. Center for Integrated Manufacturing Decision Systems.
THE MICRO-BOSS SCHEDULING SYSTEM: CURRENT STATUS AND FUTURE EFFORTS
Norman M. Sadeh *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 275-279 Sponsored in part by DOD, McDonnell Aircraft Co., and Digital Equipment Corp. (For primary document see N93-32097 12-99)
(Contract F30602-88-C-0001)
Avail: CASI HC A01/MF A04

N93-32134*# Heuristicrats, Berkeley, CA.
DECISION-THEORETIC CONTROL OF EUVE TELESCOPE SCHEDULING
Othar Hansson and Andrew Mayer (California Univ., Berkeley.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 280-287 (For primary document see N93-32097 12-99)
(Contract NAS2-13340)
Avail: CASI HC A02/MF A04

N93-32137*# Advanced Decision Systems, Mountain View, CA.
DECISION THEORY FOR COMPUTING VARIABLE AND VALUE ORDERING DECISIONS FOR SCHEDULING PROBLEMS Abstract only
Theodore A. Linden *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 305 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography.

For computer documentation see *61 Computer Programming and Software*.

N93-31078# National Materials Property Data Network, Inc., Columbus, OH.
AN INTELLIGENT KNOWLEDGE SYSTEM FOR SELECTION OF MATERIALS FOR CRITICAL AEROSPACE APPLICATIONS (IKSMAT), PHASE 2 Final Technical Report, 14 Jul. 1989 - 15 Nov. 1992
J. G. Kufman 15 Nov. 1992 179 p
(AF Proj. 3005)
(AD-A263394; WL-TR-92-4089-Phase-2) Avail: CASI HC A09/MF A02

This is the Phase 2 SBIR USAF Contract Program for the detailed design, production demonstration of a prototype intelligent knowledge system for the selection of materials for critical aerospace components (IKSMAT). IKSMAT was shown to be technically and economically feasible in a Phase 1 SBIR program, and the development of the prototype was based upon the specification defined in that effort. The IKSMAT system provides multiple-path access to a knowledge base of information vital to the assessment of the suitability of materials for key components, with a software package capable of evaluating and ranking the performance of those materials based upon specific properties and/or design-related parameters such as critical flaw size index. Users of the system are able to search for candidate materials for specific aerospace components utilizing the basic materials and selection processes programmed into the systems, adding new properties for the existing materials, adding information for materials, and/or altering the criteria and functional priorities used in rating the materials. The knowledge base for the prototype IKSMAT system was developed to support material selection for seven aerospace components: winspar, upper wing skin, lower wing skin, pivot/swivel pin, bulkhead, landing gear and fuselage. The Master IKSMAT Database for the prototype was based primarily upon MIL-HDBK-5F, with supplementary data for several sources. DTIC

N93-31108 Minnesota Univ., Minneapolis.
INVESTIGATIONS INTO DATABASE MANAGEMENT SYSTEM SUPPORT FOR EXPERT SYSTEM SHELLS, VOLUMES 1 AND 2 Ph.D. Thesis
Verlyn Mark Johnson 1993 573 p
Avail: Univ. Microfilms Order No. DA9312489

Many expert system shells are available for developing production rule based expert system applications. However, it is difficult to rapidly change those applications to respond to changing business conditions. Each shell has its own production rule language and inferencing capabilities. It is unclear what information can be shared (reused). Use of main memory instead of a shared, common source for rules constrains the size of applications and can result in duplication. Maintenance is not immediately available to existing inference sessions and updates made by a session only affect that session. Production rules and working storage as data that can be managed by enhanced database management systems (DBMS's) is addressed. Five expert system shells are studied. A composite (canonical) production rule syntax is developed which provides knowledge engineers with a common language for production rules. It is mapped into an integrated data model for use by tool developers who wish to design common production rule storage databases and maintenance tools. Extensions to the data model allow expert system shell developers to reduce main memory constraints by using a DBMS to store and manage execution data. The analysis performed in building the data model reveals where translation,

system enhancements, or standard definitions are required to share production rules. Two DBMS enhancements are defined to facilitate management of production rule and execution data (but which also have other applications). Reflexive indexes enable a DBMS to incrementally maintain transitive closures (including multiple tables, duplicates, side paths, and accumulated values) as a database index. They simplify query formats, and eliminate the need for recursive processing during retrieval. One use is to accumulate rule premise evaluation values during inferencing. The inference locking protocol allows concurrent, dynamic access by those maintaining and executing control data. For example, it provides greater flexibility in maintaining production rules by allowing knowledge engineers to use multiple versions and notification to control how updates to production rules affect other maintenance and inference sessions. The protocol can also be used to extend production rule capabilities by allowing production rules to maintain production rules concurrently with other maintenance and inference sessions. Dissert. Abstr.

N93-31132 Texas Univ., Austin.
SCHEDULING DATA TRANSFERS IN PARALLEL COMPUTERS AND COMMUNICATIONS SYSTEMS Ph.D. Thesis
Ravi Kumar Jain 1992 227 p
Avail: Univ. Microfilms Order No. DA9309195

The performance of many applications of parallel computers and communications systems is limited by the speed of data transfers rather than the speed of processing. An important, but neglected, aspect of resource management to overcome this bottleneck is the scheduling of data transfers. Data transfer scheduling differs from traditional scheduling problems in that data transfer tasks require multiple resources simultaneously, rather than a single resource serially, in order to execute. The data transfer scheduling problem by first defining a general model for precisely specifying and classifying scheduling problems is studied. The model is used for the recognition of the similarity of seemingly different problems from different application areas, for the systematic transformation of one problem specification into that of a seemingly different problem, and for the systematic decomposition of a problem specification into solvable subproblems. Polynomial-time, optimal, and approximate algorithms are obtained for a wide range of data transfer scheduling problems under a variety of architectural and logical constraints, including communication architectures in which resources are fully connected, communication architectures with a tree topology, and the presence of mutual exclusion and precedence constraints. Our algorithms either generalize previous results for these problems, or provide better performance, or both. Our results are applicable to both parallel computers and communications systems, including certain types of shared-bus multiprocessor systems such as the Sequent and the IBM RP3, hierarchical switching systems, tree-structured multiprocessor architectures, and intersatellite communications systems.
Dissert. Abstr.

N93-31135 George Washington Univ., Washington, DC.
KNOWLEDGE-BASED FRAMEWORK FOR AN AUTOMATED USER INTERFACE PRESENTATION DESIGN TOOL Ph.D. Thesis
Won Chul Kim 1993 246 p
Avail: Univ. Microfilms Order No. DA9310543

The capabilities of user interface design tools can be enhanced by providing high-level design control throughout the user interface presentation design process. Current user interface builders provide only low-level assistance, because they have knowledge of neither the application, nor the principles by which interface elements are combined effectively. A framework that unites the essential knowledge components needed for effective user interface presentation design was developed. The framework consists of an application model (both a data model and a control model), a design process model that supports top-down iterative development, and graphic design knowledge that is used both to place dialog box elements such that their application dependent logical relationships are visually reinforced and to control design symmetry and balance. To demonstrate the framework's viability, a tool based on encapsulated design knowledge that establishes high-level style preferences and provides expert assistance to create the user interface presentation design automatically was constructed. The design process architecture developed incorporates models of the three major design tasks of user interface presentation design: (1) content organization; (2) interface object selection; and (3) presentation design layout. A designer is guided through each stage of the design process. The design tool provides high-level design control by allowing a designer to specify the high-level preferences prior to each design activity and by allowing a designer to modify automated design decisions interactively after each design activity. By working with the design tool in a cooperative manner, a designer is able to constrain and explore the design space to automatically generate menu and dialog box presentation that can be further refined until a presentation that meets a designer's needs is generated. The underlying knowledge base is transformed automatically at each stage until the final presentation design representation is generated. The effectiveness of the design tool comes from the knowledge base representation of various stages of the interface design process and embedded design knowledge that supplements a designer's knowledge.
Dissert. Abstr.

N93-31144 Missouri Univ., Rolla.
THE MANAGEMENT OF REPLICATED DATA Ph.D. Thesis
Hsueh-Chi Shih 1992 147 p
Avail: Univ. Microfilms Order No. DA9311039

Data replication, which has the benefits of improving system availability and read performance, proved to be indispensable to many database applications. In a replicated database, the one-copy serializability of transaction executions can be ensured by employing a replica control mechanism on top of the traditional concurrency control mechanism. This work contains two replica control algorithms and a read-only transaction processing algorithm. Both replica control algorithms handle multiple site, communication and partitioning failures. The replica control algorithms achieve read operation efficiency by always translating a logical read operation into one local physical read operation and by taking advantage of the locality of references. The replica control algorithms improve system availability by adapting dynamically to the system configuration and by speeding up the recovery process with the embedded recovery mechanism. While the first replica control algorithm is strictly pessimistic, the second one takes a more optimistic view. For processing read-only transactions, two consistency criteria are defined and their properties explored. Based on these findings, a read-only transaction processing algorithm is carefully designed to efficiently check the consistency of an arbitrary set of physical copies. The correctness of all algorithms are formally proved.
Dissert. Abstr.

N93-31215# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Technical Information Panel.
THE IMPACT OF CHANGING INTERNATIONAL RELATIONS ON THE SCIENTIFIC AND TECHNICAL COMMUNITY [INCIDENCE SUR LA COMMUNAUTE SCIENTIFIQUE ET TECHNIQUE DES TRANSFORMATIONS EN COURS DANS LES RELATIONS INTERNATIONALES]
Apr. 1993 99 p Specialists' Meeting held in Copenhagen, Denmark, 14-15 Oct. 1992
(AGARD-CP-523; ISBN-92-835-0708-8) Copyright Avail: CASI HC A05/MF A02

The papers from the Technical Information Panel's Specialists' Meeting, held in Copenhagen, Denmark on 14-15 Oct. 1992, are presented. The following topics are covered: the interaction between technology and culture, an overview of recent political changes, the effects on the exchange of scientific and technical information of these changes and consequent economic ones, the problems of managing change, forecasting and planning for change, and some of the new technologies that will help to overcome the problems raised by these changes. For individual titles, see N93-31216 through N93-31223.

N93-31216# Commission of the European Communities, Brussels (Belgium).
THE EFFECT OF CHANGES IN MARKETS AND TRADE BARRIERS ON THE EXCHANGE OF SCIENTIFIC AND TECHNICAL INFORMATION
Bridget Czarnota *In* AGARD, The Impact of Changing International Relations on the Scientific and Technical Community Apr. 1993 3 p
(For primary document see N93-31215 12-82)
Copyright Avail: CASI HC A01/MF A02

The purpose of this paper is to examine the consequences of changes in markets and trade barriers in the exchange of scientific and technical information. The European Community is a particularly appropriate starting point to examine such a question since, as presently constituted, it represents

a market of over 30 million people brought together in a single market by virtue of the Treaty of Rome. Undoubtedly, at the time of the signing of that Treaty by the original members of the Community, the same question was asked, namely, how will economic union affect the distribution and circulation of information. Undoubtedly, each Member State that has subsequently joined the market has raised the same issue. And it is certainly a question which arises in a particularly vivid form by the non-static nature of the Community itself. Over and above the Internal Market as we currently know it, we have other dimensions which we must take into account. One of these dimensions is of course that of Maastricht--the question of how far towards closer monetary and political union the Member States are ready to go. The responsibilities will be extended in policy areas such as the environment, consumer protection, health, and education. One of the crucial questions is whether all these far reaching advances in policy areas will finally lead to a European identity. Many commentators however, now focus on Maastricht as a turning point in the Community's history without understanding the realities of the existing market. Author (revised)

N93-31217*# NASA Center for AeroSpace Information, Baltimore-Washington International Airport, MD.

NEWLY AVAILABLE TECHNOLOGIES PRESENT EXPANDING OPPORTUNITIES FOR SCIENTIFIC AND TECHNICAL INFORMATION EXCHANGE

Jean M. Tolzman *In* AGARD, The Impact of Changing International Relations on the Scientific and Technical Community Apr. 1993 12 p Previously announced as N93-22470 Sponsored by NASA, Washington (For primary document see N93-31215 12-82)

Copyright Avail: CASI HC A03/MF A02

The potential for expanded communication among researchers, scholars, and students is supported by growth in the capabilities for electronic communication as well as expanding access to various forms of electronic interchange and computing capabilities. Increased possibilities for information exchange, collegial dialogue, collaboration, and access to remote resources exist as high-speed networks, increasingly powerful workstations, and large, multi-user computational facilities are more frequently linked and more commonly available. Numerous writers speak of the telecommunications revolution and its impact on the development and dissemination of knowledge and learning. One author offers the phrase 'Scholarly skywriting' to represent a new form of scientific communication that he envisions using electronic networks. In the United States (U.S.), researchers associated with the National Science Foundation (NSF) are exploring 'nationwide collaboratories' and 'digital collaboration.' Research supported by the U.S. National Aeronautics and Space Administration (NASA) points to a future where workstations with built-in audio, video monitors, and screen sharing protocols are used to support collaborations with colleagues located throughout the world. Instruments and sensors located worldwide will produce data streams that will be brought together, analyzed, and distributed as new findings. Researchers will have access to machines that can supply domain-specific information in addition to locator and directory assistance. New forms of electronic journals will emerge and provide opportunities for researchers and scientists to exchange information electronically and interactively in a range of structures and formats. Ultimately, the wide-scale use of these technologies in the dissemination of research results and the stimulation of collegial dialogue will change the way we represent and express our knowledge of the world. A new paradigm will evolve--perhaps a truly worldwide 'invisible college.' Author (revised)

N93-31218# Ministry of Education and Research, Copenhagen (Denmark).

INTEGRATED ACCESS TO DISTRIBUTED DATABASES THROUGH INTELLIGENT INTERFACES

Inge BergHansen *In* AGARD, The Impact of Changing International Relations on the Scientific and Technical Community Apr. 1993 7 p (For primary document see N93-31215 12-82)

Copyright Avail: CASI HC A02/MF A02

The IANI interface is one of many attempts to produce efficient access to databases on different hosts. IANI stands for Intelligent Access to Nordic Information and was started as a project by the Nordic Council for Scientific Information in 1986. The aim of the project was to produce an interface which would allow Nordic users to access Nordic databases with one login procedure and one command language. The development of the prototype was a true cooperative exercise involving the Danish contractor CRI and the hosts of union catalogues in Denmark, Finland, and Sweden. After implementation of the prototype software, a Norwegian union catalogue host was added. The prototype was developed for an IBM-compatible PC. Later, the software was ported to a UNIX machine where IANI may serve as a gateway in specific applications. It has been used in an information training scheme by the Ministry of Education for Danish school children. The IANI concept has turned out to be a useful tool for integration of groups of databases. In 1991 it was used for integrated access to the catalogues of libraries of the major European Institutions in the EUROLIB-project. The attempts to integrate the database world through IANI have demonstrated that it is feasible to produce integrated database access in a few weeks. Experience has, however, also shown that database and network access procedures are changed so frequently, that the maintenance costs for interface products are high. The next step on the way towards integration of databases is expected to be implementation of the new ISO Search and Retrieve Standard which now is being used in pilot projects sponsored by NORDINFO and the Commission of EC. The paper concludes with a recommendation to use the many interface prototypes which have been produced in international R&D programs, but still need further development in order to become stable products which can be sold to the information world. Author (revised)

N93-31219# Siemens A.G., Munich (Germany).

AUTOMATING MULTILINGUAL COMMUNICATION

Thomas Schneider *In* AGARD, The Impact of Changing International Relations on the Scientific and Technical Community Apr. 1993 4 p (For primary document see N93-31215 12-82)

Copyright Avail: CASI HC A01/MF A02

The integration of Europe and the increasing economic interdependence across continents require an increasing amount of communication across linguistic boundaries. The need for rapid information transfer cannot be met by conventional methods of translation. Thus, the introduction of machine translation seems inevitable. If, in the past, MT systems had not been entirely successful, advances in hardware as well as linguistic approaches have led to the development of viable systems. In the following, the structure of one such operative system will be described in detail.

Author (revised)

N93-31220# Technical Univ. of Norway, Trondheim. Dept. of Information Retrieval.

END USERS: NEW PRODUCTS AND SERVICES

Aud Lamvik *In* AGARD, The Impact of Changing International Relations on the Scientific and Technical Community Apr. 1993 3 p (For primary document see N93-31215 12-82)

Copyright Avail: CASI HC A01/MF A02

The database industry is young. Twenty to twenty-five years ago online databases were little more than a dream, and most of us didn't even dream about CD-ROM and multimedia databases. Much has happened in this business since the first databases took off. The Nordic countries entered the database scene early. In Sweden, the SDI service EPOS/VIRA was started as early as in 1967, and in 1972 the first on-line service, MIC/MEDLARS, was set up in Stockholm, hosting databases mainly within medical disciplines. Both services got users from all of the Nordic countries. In the same period, online searching at hosts such as DIALOG and ESA-IRS got a start, and several Nordic databases emerged--with various search languages on several hosts in each country. At the end of the 70's online searching was relatively well established in science and technology (including medicine). The users were primarily intermediaries in university and research libraries, i.e., scientists and engineers in the libraries. A survey within European countries in 1987 showed that the persons involved in searching were 'still mainly scientists and engineers.' End users are today important market groups for database producers and hosts. Much of the growth in database usage has been expected here. Numerous products and services have been introduced for easier and more efficient information retrieval and management to attract end users. Author (revised)

N93-31221# Orsted Inst., Copenhagen (Denmark). Inst. of Mathematics.

THE MODERN RESEARCH ENVIRONMENT

Flemming Topsoe *In* AGARD, The Impact of Changing International Relations on the Scientific and Technical Community Apr. 1993 5 p (For primary document see N93-31215 12-82)

Copyright Avail: CASI HC A01/MF A02

Information Technology and the scientific and technical communities are discussed. The following topics are addressed: the ideal user community, the ideal user platform, the ideal user support organization, the significance of structure, Networked Information Retrieval (NIR), Euromath and EmNet, and collaboration with Central and Eastern Europe. Author (revised)

N93-31222# Hudson Rivers Consultancy, Woodford Green (England).
THE MANAGEMENT OF CHANGE: IMPLICATIONS FOR THE INFORMATION PROFESSIONAL
Beryl Morris *In* AGARD, The Impact of Changing International Relations on the Scientific and Technical Community Apr. 1993 3 p (For primary document see N93-31215 12-82)
Copyright Avail: CASI HC A01/MF A02

All organizations are facing considerable pressures which have led to unprecedented change. In the paper I would like to address some of the drivers for change in the information world and look at the impact on the information professional. I thought I would conclude with some of the concepts which will be essential to our survival and, I hope, prosperity in the future. Author (revised)

N93-31223# Information International Associates, Inc., Oak Ridge, TN.
FORECASTING AND PLANNING FOR CHANGING PATTERNS OF SCIENTIFIC AND TECHNICAL COMMUNICATION (STC)
Bonnie C. Carroll *In* AGARD, The Impact of Changing International Relations on the Scientific and Technical Community Apr. 1993 23 p (For primary document see N93-31215 12-82)
Copyright Avail: CASI HC A03/MF A02

There are many changes taking place today in the methods and conduct of research and development. These changes have impact and are impacted by the methods of scientific and technical communication. The rapid advances in information technology (computing, telecommunications, and user interfaces) is a root cause of much of this change. The paper will begin by setting the stage with an overview of some issues, statistics, and conclusions about changing patterns in scientific and technical communications system. It will then review plans and strategies of nations and major organizations that were put forward to deal with the changing nature of the information infrastructure and system. Highlights from the following countries will be included: the United States, Germany, and Japan. For the United States, a more highly focused review will be made of areas of interest to AGARD. This will include directions for the NASA Scientific and Technical Information Program in the United States. Responses to the management of changing conditions will be highlighted throughout the paper. In conclusion, comparisons among strategies as well as the relationship between strategies and the fundamental changes in research and development communications will be made. Author (revised)

N93-31315*# National Aeronautics and Space Administration, Washington, DC.
MODERNIZATION AND NEW TECHNOLOGIES: COPING WITH THE INFORMATION EXPLOSION
Walter R. Blados and Gladys A. Cotter Aug. 1993 14 p
(NASA-TM-109410; NAS 1.15:109410) Avail: CASI HC A03/MF A01

Information has become a valuable and strategic resource in all societies and economies. Scientific and technical information is especially important in developing and maintaining a strong national science and technology base. The expanding use of information technology, the growth of interdisciplinary research, and an increase in international collaboration are changing characteristics of information. This modernization effort applies new technology to current processes to provide near-term benefits to the user. At the same time, we are developing a long-term modernization strategy designed to transition the program to a multimedia, global 'library without walls'. Notwithstanding this modernization program, it is recogized that no one information center can hope to collect all the relevant data. We see information and information systems changing and becoming more international in scope. We are finding that many nations are expending resources on national systems which duplicate each other. At the same time that this duplication exists, many useful sources of aerospace information are not being collected to cover expanded sources of information. This paper reviews the NASA modernization program and raises for consideration new possibilities for unification of the various aerospace database efforts toward a cooperative international aerospace database initiative, one that can optimize the cost/benefit equation for all participants. Author (revised)

N93-31331# National Inst. of Standards and Technology, Gaithersburg, MD. Advanced Systems Div.
NIST SCORING PACKAGE CERTIFICATION PROCEDURES IN CONJUNCTION WITH NIST SPECIAL DATABASES 2 AND 6
M. D. Garris Apr. 1993 27 p See also PB92-238542 and PB93-120707
(PB93-188126; NISTIR-5173) Avail: CASI HC A03/MF A01

The procedures outlined in the report have been developed by the National Institute of Standards and Technology (NIST) in order to promote compliance with existing NIST Scoring Package file formats. Through certification, the proper use of the Scoring Package is promoted and the successful scoring of recognition system data is maximized. The certification procedures presented in the document have been developed in conjunction with NIST Special Database 2 (SD2) and NIST Special Database 6 (SD6). These two databases contain images of synthesized tax forms. The data entered on the forms appears real, but the values have been generated at random by a computer. NIST offers certification to any organization that has purchased the Scoring Package and requests the service. NTIS

N93-31481# Amsterdam Univ. (Netherlands). Dept. of Mathematics and Computer Science.
INFORMATION SYSTEMS AS COALGEBRAS
Raymond Hoofman 15 Oct. 1992 16 p
(ML-92-08; ETN-93-94143) Avail: CASI HC A03/MF A01

A study showing that the category 'Cinf' of continuous information systems can be constructed from the category 'Rel' of sets and relations in a systematic way is presented. Cinf is the category of coalgebras of the lower powerdomain comonad on the Karoubi envelope of Rel. Informally, this means that the category of continuous dcpo's is in proportion to the Karoubi envelope of Rel, like the category of sets and functions is in proportion to Rel. ESA

N93-31498# Technische Univ., Delft (Netherlands). Faculty of Technical Mathematics and Informatics.
RECENT DEVELOPMENTS IN DATABASE MANAGEMENT
J. H. terBekke 1992 19 p
(Rept-92-61; ETN-93-94253) Copyright Avail: CASI HC A03/MF A01

A review of the developments in data bases during the last two decades is presented. These developments are subsequently taken as a starting point for the discussion of recent developments in the discipline. An analysis of the shortcomings of existing methods leads to the introduction of a new approach for data modeling and one for systems modeling. ESA

N93-31535# Technical Research Centre of Finland, Espoo. Information Service.
PUBLICATION CATALOGUE OF VTT IN 1991 [VTTS PUBLIKATIONSKATALOG 1991]
Feb. 1992 285 p In ENGLISH and FINNISH
(VTT-TIED-1340; ISBN-9-51-384153-7; ETN-93-94013) Copyright Avail: CASI HC A13/MF A03; Government Printing Center, P.O. Box 516, SF-00101, Helsinki, Finland, and VTT Information Service, P.O. Box 42, SF-02151 Espoo, Finland, HC

The catalog presents the publication series of the Technical Research Center of Finland (VTT) and the other publication activity of the personnel in 1991. The information is based on a publication register maintained by VTT's Information Service into which the activity units give information on the new publications. The publication catalog contains a diagram showing the development of VTT's publication activity in 1984-1991. Publications are listed per activity unit. The publications of each activity unit are classified into the following groups: scientific publications; conference papers; publication series of VTT; and other publications. ESA

N93-31596 Royal Netherlands Meteorological Inst., De Bilt.
LIST OF ACRONYMS IN ENVIRONMENTAL SCIENCES
Oct. 1991 40 p
(KNMI-Publ-180-Ed-1; ISBN-9-03-692003-5; ETN-93-93928) Copyright Avail: Issuing Activity (Royal Netherlands Meteorological Inst., P.O. Box 201, 3730 AE De Bilt, Wilhelminalaan 10, Netherlands)

A list of acronyms used in environmental and related sciences such as

meteorology, oceanography, remote sensing, and data communication is presented. The list was compiled from various national and internationl sources. It is the intention to publish an updated edition periodically. An online version of the list is available through 'SCIENCEnet' a world wide electronic mail service. The address form whence copies are available is given. ESA

N93-31605 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.
QUALITY SUPPORT TOOL OF SIMULATION MODELS: A COMPARISON BETWEEN METHODOLOGY [STRUMENTI DI SUPPORTO ALLA SCELTA DI MODELLI DI SIMULAZIONE: UN CONFRONTO TRA METODOLOGIE]
G. Calori 1992 27 p In ITALIAN
(Rept-92-061/BIS; ETN-93-93993) Avail: Issuing Activity (Politecnico di Milano, Piazza Leondardo da Vinci 32, 20133 Milan, Italy)

The problem of the most appropriate quality model for simulation of a data environment is addressed. Individualizing the relevant dimensions for quality, focus is exclusively on aspects related to the physical reality of simulation. Two different approaches, based on combining the technical characteristics of the expert system environment and of data bases, to analyzing their discriminatory capacity in problem comparison are presented. The application examples discussed concern the particular case of the management of a model bank for the simulation of short-medium radius dispersion of atmospheric pollution. ESA

N93-31615# Universiteit Twente, Enschede (Netherlands). Dept. of Computer Science.
THE PERFORMANCE OF INTEGRITY CONTROL THROUGH TRANSACTION MODIFICATION IN A PARALLEL MAIN-MEMORY DATABASE SYSTEM
Paul W. P. J. Grefen Aug. 1992 27 p
(MEMO-INF-92-54; ETN-93-94106) Copyright Avail: CASI HC A03/MF A01

Integrity control is an important task of modern database management systems. One of the key problems impeding its general use in real world applications is formed by the high processing costs associated with integrity constraint enforcement. Notwithstanding this observation, little attention has been paid in literature to the performance evaluation of integrity control mechanisms. This issue is addressed with threefold message: integrity control is shown to be easily integrated into a parallel, main memory data base system; parallelism and main memory data storage are demonstrated to be effective ways to deal with costly constraint enforcement; the overhead of constraint enforcement is shown to be acceptable compared to the execution of transactions without integrity control. The conclusion that integrity control is feasible in high performance database systems is drawn. ESA

N93-31796# Department of Defense, Washington, DC.
STANDARDIZATION DIRECTORY: FSC CLASS AND AREA ASSIGNMENTS
1 May 1993 105 p Revised
(AD-A265686) Avail: CASI HC A06/MF A02

The Standardization Directory (SD-1) provides the responsibilities of all activities with an interest in the Defense Standardization Program. SD-1 is intended to be more than directory listings of names, addresses, and phone numbers. Our intent is to make it easy to determine who has responsibility or interest in a particular document (when circulating documents), who is interested in reviewing it, and who wants a copy of the final issued document. We continue to add information on who has electronic capabilities for preparing, circulating, and distributing documents, so we have added FAX numbers, electronic mailing addresses (as available), and electronic formats. DTIC

N93-31833 Environmental Protection Agency, Washington, DC. Office of Pollution, Prevention, and Toxics.
TSCA CONFIDENTIAL BUSINESS INFORMATION SECURITY MANUAL
Jan. 1993 139 p Supersedes PB85-137305 and PB82-177759 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB93-184844) Avail: Issuing Activity (National Technical Information Service (NTIS))

The manual sets forth procedures for Environmental Protection Agency (EPA) employees, other Federal employees, contractors, and contractor employees to follow in handling information claimed as confidential business information (CBI) under Section 14 of the Toxic Substances Control Act (TSCA). That section of TSCA requires EPA to protect from public disclosure CBI obtained under TSCA, and it imposes criminal penalties for the knowing and willful unauthorized release or disclosure of such information. EPA has issued regulations (40 CFR Part 2) that implement TSCA's confidentiality provisions. The procedures in the manual supplement those set forth in TSCA and in 40 CFR Part 2. NTIS

N93-31854 Illinois Inst. of Tech., Chicago.
CREATING A STRUCTURED KNOWLEDGE BASE BY PARSING NATURAL LANGUAGE TEXT Ph.D. Thesis
Glenn Norman Mayer 1992 129 p
Avail: Univ. Microfilms Order No. DA9311947

The tools and methodologies necessary to perform automated conversion of natural language text into a structured knowledge base are developed. More specifically, it takes a chapter on cardiovascular pathophysiology from a textbook written by Joel Michael and converts the text into a structured knowledge base to be used as the domain knowledge base of a tutoring system. The knowledge contained in the chapter is background medical knowledge important to the solution of problems in cardiovascular physiology. This research project was divided into four phases. Each phase places the information in a more convenient form for the succeeding phase. The first two phases operate on single sentences while the last two phases require larger units such as paragraphs or sections as input. The four phases are: (1) preparation of text, (2) parsing of text, (3) conversion of parse trees to information formats, and (4) conversion of information formats to frames. The Preparation of Text phase converts the raw text from the chapter into a form suitable for the LSP parser by removing incompatible data, correcting errors, numbering sentences, and converting all characters to upper case. The tools used in this phase consist of a series of C programs. The Parsing of the chapter is done with the Linguistic String Parser (LSP) developed at New York University. In order to successfully parse the chapter, the vocabulary and grammar that is supplied with the LSP was extended. A sublanguage study was performed to identify those words and grammatical constructs that were missing from those supplied with the LSP. The conversion of parse trees to information formats and then to frames was done using the AI language CLIPS. CLIPS was developed at NASA's Johnson Space Center.
Dissert. Abstr.

N93-31923* National Aeronautics and Space Administration, Washington, DC.
NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 1: ABSTRACTS (SUPPLEMENT 43)
Jul. 1993 59 p
(NASA-SP-7039(43)-Sect-1; NAS 1.21:7039(43)-Sect-1) Avail: CASI HC A04

Abstracts are provided for 128 patents and patent applications entered into the NASA scientific and technical information system during the period Jan. 1993 through Jun. 1993. Each entry consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application. Author (revised)

N93-31964*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
GODDARD CONFERENCE ON MASS STORAGE SYSTEMS AND TECHNOLOGIES, VOLUME 2
Ben Kobler, ed. and P. C. Hariharan, ed. (ST Systems Corp., Lanham, MD.) 1993 279 p Conference held in Greenbelt, MD, 22-24 Sep. 1992
(NASA-CP-3198-Vol-2; NAS 1.55:3198-Vol-2) Avail: CASI HC A13/MF A03

Papers and viewgraphs from the conference are presented. Discussion topics include the IEEE Mass Storage System Reference Model, data archiving standards, high-performance storage devices, magnetic and magneto-optic storage systems, magnetic and optical recording technologies, high-performance helical scan recording systems, and low end helical scan tape drives. Additional discussion topics addressed the evolution of the identifiable unit for processing (file, granule, data set, or some similar

object) as data ingestion rates increase dramatically, and the present state of the art in mass storage technology. For individual titles, see N93-31965 through N93-31980.

N93-31965*# IBM Federal Systems Div., Houston, TX.
CURRENT STATE OF THE MASS STORAGE SYSTEM REFERENCE MODEL
Robert Coyne *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 357-376 (For primary document see N93-31964 12-82)
Avail: CASI HC A03/MF A03

IEEE SSSWG was chartered in May 1990 to abstract the hardware and software components of existing and emerging storage systems and to define the software interfaces between these components. The immediate goal is the decomposition of a storage system into interoperable functional modules which vendors can offer as separate commercial products. The ultimate goal is to develop interoperable standards which define the software interfaces, and in the distributed case, the associated protocols to each of the architectural modules in the model. The topics are presented in viewgraph form and include the following: IEEE SSSWG organization; IEEE SSSWG subcommittees & chairs; IEEE standards activity board; layered view of the reference model; layered access to storage services; IEEE SSSWG emphasis; and features for MSSRM version 5. Derived from text

N93-31966*# Computer and Business Equipment Mfrs. Association, Washington, DC.
THE STANDARDS PROCESS: X3 INFORMATION PROCESSING SYSTEMS
Jean-Paul Emard *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 377-393 (For primary document see N93-31964 12-82)
Avail: CASI HC A03/MF A03

The topics are presented in viewgraph form and include the following: International Organization for Standards (ISO); International Electrotechnical Committee (IEC); ISO/IEC Joint Technical Committee 1 (JTC-1); U.S. interface to JTC-1; ANSI; national organizations; U.S. standards development processes; national and international standards developing organizations; regional organizations; and X3 information processing systems. CASI

N93-31967*# Storage Technology Corp., Louisville, CO.
THE STANDARDS PROCESS: TECHNICAL COMMITTEE X3B5 DIGITAL MAGNETIC TAPE
Sam Cheatham *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 395-410 (For primary document see N93-31964 12-82)
Avail: CASI HC A03/MF A03

The definition of X3B5, where it fits in the national and international standards development process, and how it interfaces and influences the world community of standards developers are provided. Details concerning the focus of the committee, how it operates, and what the group sees as the future trends in the area of interchange standards utilizing the multifaceted, ubiquitous magnetic tape are presented. Author (revised)

N93-31968*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
ACCESSING EARTH SCIENCE DATA FROM THE EOS DATA AND INFORMATION SYSTEM
Kenneth R. McDonald (National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.) and Sherri Calvo (National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.) *In its* Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 423-429 (For primary document see N93-31964 12-82)
Avail: CASI HC A02/MF A03

An overview of the Earth Observing System Data and Information System (EOSDIS) is presented, concentrating on the users' interactions with the system and highlighting those features that are driven by the unique requirements of the Global Change Research Program and the supported science community. However, a basic premise of the EOSDIS is that the system must evolve to meet changes in user needs and to incorporate advances in data system technology. Therefore, the development process which is being used to accommodate these changes and some of the potential areas of change are also addressed. Derived from text

N93-31969*# Media Logic, Inc., Plainville, MA.
RECORDING AND WEAR CHARACTERISTICS OF 4 AND 8 MM HELICAL SCAN TAPES **c35**
Klaus J. Peter and Dennis E. Speliotis (Advanced Development Corp., Burlington, MA.) *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 431-447 (For primary document see N93-31964 12-82)
Avail: CASI HC A03/MF A03

Performance data of media on helical scan tape systems (4 and 8 mm) is presented and various types of media are compared. All measurements were performed on a standard MediaLogic model ML4500 Tape Evaluator System with a Flash Converter option for time based measurements. The 8 mm tapes are tested on an Exabyte 8200 drive and 4 mm tapes on an Archive Python drive; in both cases, the head transformer is directly connected to a Media Logic Read/Write circuit and test electronics. The drive functions only as a tape transport and its data recover circuits are not used. Signal to Noise, PW 50, Peak Shift and Wear Test data is used to compare the performance of MP (metal particle), BaFe, and metal evaporate (ME). ME tape is the clear winner in magnetic performance but its susceptibility to wear and corrosion, make it less than ideal for data storage. Derived from text

N93-31970*# California Univ., Berkeley. Computer Science Dept.
STRIPED TAPE ARRAYS **c35**
Ann L. Drapeau *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 449-456 (For primary document see N93-31964 12-82)
Avail: CASI HC A02/MF A03

The topics are presented in viewgraph form and include the following: introduction to striping; applications; tape technologies; robots; access times; striping options and issues; and reliability issues. CASI

N93-31971*# Carnegie-Mellon Univ., Pittsburgh, PA. Engineering Research Dept.
ULTRA-HIGH DENSITY RECORDING TECHNOLOGIES
Mark H. Kryder *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 457-476 (For primary document see N93-31964 12-82)
Avail: CASI HC A03/MF A03

The Engineering Research Center in Data Storage Systems at Carnegie Mellon University in cooperation with the National Storage Industry Consortium has selected goals of achieving 10 Gbit/sq in. recording density in magnetic and magneto-optic disk recording and 1 terabyte/cubic in. magnetic tape recording technologies. This talk describes the approaches being taken and the status of research leading to these goals. Derived from text

N93-31972*# National Media Lab., Saint Paul, MN.
NATIONAL MEDIA LABORATORY: MEDIA TESTING RESULTS
Bill Mularie and Gary Ashton *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 477-488 (For primary document see N93-31964 12-82)
Avail: CASI HC A03/MF A03

The topics are presented in viewgraph form and include the following: an overview of the National Media Laboratory and the results of D-1 testing. CASI

N93-31973*# Culver (W. J.) Consulting, Inc., Vienna, VA.
GRAND CHALLENGES IN MASS STORAGE: A SYSTEM INTEGRATOR'S PERSPECTIVE
Dan Mintz and Richard Lee (Data Storage Technologies, Inc., Ridgewood, NJ.) *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 489-497 (For primary document see N93-31964 12-82)
Avail: CASI HC A02/MF A03

The grand challenges are the following: to develop more innovation in approach; to expand the I/O barrier; to achieve increased volumetric efficiency and incremental cost improvements; to reinforce the 'weakest link' software; to implement improved architectures; and to minimize the

impact of self-destructing technologies. Mass storage is defined as any type of storage system exceeding 100 GBytes in total size, under the control of a centralized file management scheme. The topics covered are presented in viewgraph form. CASI

N93-31974*# Eastman Kodak Co., Rochester, NY. Electronic Imaging Storage Research Labs.

KODAK PHASE-CHANGE MEDIA FOR OPTICAL TAPE APPLICATIONS **c35**

Yuan-Sheng Tyan, Donald R. Preuss, George R. Olin, Fridrich Vazan, Kee-Chuan Pan, and Pranab. K. Raychaudhuri *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 499-511 (For primary document see N93-31964 12-82)

Avail: CASI HC A03/MF A03

The SbInSn phase-change write-once optical medium developed by Eastman Kodak Company is particularly suitable for development into the next generation optical tape media. Its performance for optical recording has already been demonstrated in some of the highest performance optical disk systems. Some of the key performance features are presented. Derived from text

N93-31975*# Optex, Inc., Rockville, MD.

ELECTRON TRAPPING OPTICAL DATA STORAGE SYSTEM AND APPLICATIONS **c35**

Daniel Brower, Allen Earman, and M. H. Chaffin *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 513-520 (For primary document see N93-31964 12-82)

Avail: CASI HC A02/MF A03

A new technology developed at Optex Corporation out-performs all other existing data storage technologies. The Electron Trapping Optical Memory (ETOM) media stores 14 gigabytes of uncompressed data on a single, double-sided 130 mm disk with a data transfer rate of up to 120 megabits per second. The disk is removable, compact, lightweight, environmentally stable, and robust. Since the Write/Read/Erase (W/R/E) processes are carried out photonically, no heating of the recording media is required. Therefore, the storage media suffers no deleterious effects from repeated W/R/E cycling. This rewritable data storage technology has been developed for use as a basis for numerous data storage products. Industries that can benefit from the ETOM data storage technologies include: satellite data and information systems, broadcasting, video distribution, image processing and enhancement, and telecommunications. Products developed for these industries are well suited for the demanding store-and-forward buffer systems, data storage, and digital video systems needed for these applications. Derived from text

N93-31976*# Advanced Development Corp., Burlington, MA.

DATA STORAGE: RETROSPECTIVE AND PROSPECTIVE

Dennis E. Speliotis *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 535-537 (For primary document see N93-31964 12-82)

Avail: CASI HC A01/MF A03

We study history to learn from its lessons so we don't repeat the mistakes. Ironically, however, sometimes it seems that the lessons we learn from history is how to repeat the mistakes more precisely. A brief discussion about the history of magnetic recording is presented, and the lessons of the past are used to look into the future. Derived from text

N93-31977*# Supercomputer Research Center, Bowie, MD.

MEASUREMENTS OVER DISTRIBUTED HIGH PERFORMANCE COMPUTING AND STORAGE SYSTEMS

Elizabeth Williams and Tom Myers (Department of Defense, Fort Meade, MD.) *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 539-572 (For primary document see N93-31964 12-82)

Avail: CASI HC A03/MF A03

A strawman proposal is given for a framework for presenting a common set of metrics for supercomputers, workstations, file servers, mass storage systems, and the networks that interconnect them. Production control and database systems are also included. Though other applications and third part software systems are not addressed, it is important to measure them as well. Derived from text

N93-31978*# Illinois Univ., Champaign. National Center for Supercomputing.

PERFORMANCE OF A DISTRIBUTED SUPERSCALAR STORAGE SERVER

Arlan Finestead and Nancy Yeager *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 573-580 (For primary document see N93-31964 12-82)

Avail: CASI HC A02/MF A03

The RS/6000 performed well in our test environment. The potential exists for the RS/6000 to act as a departmental server for a small number of users, rather than as a high speed archival server. Multiple UniTree Disk Server's utilizing one UniTree Disk Server's utilizing one UniTree Name Server could be developed that would allow for a cost effective archival system. Our performance tests were clearly limited by the network bandwidth. The performance gathered by the LibUnix testing shows that UniTree is capable of exceeding ethernet speeds on an RS/6000 Model 550. The performance of FTP might be significantly faster if asked to perform across a higher bandwidth network. The UniTree Name Server also showed signs of being a potential bottleneck. UniTree sites that would require a high ratio of file creations and deletions to reads and writes would run into this bottleneck. It is possible to improve the UniTree Name Server performance by bypassing the UniTree LibUnix Library altogether and communicating directly with the UniTree Name Server and optimizing creations. Although testing was performed in a less than ideal environment, hopefully the performance statistics stated in this paper will give end-users a realistic idea as to what performance they can expect in this type of setup. Derived from text

N93-31979*# Storage Technology Corp., Louisville, CO.

THE REDWOOD PROJECT: AN OVERVIEW

Sam Cheatham *In* NASA. Goddard Space Flight Center, Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 581-597 (For primary document see N93-31964 12-82)

Avail: CASI HC A03/MF A03

Redwood is a new generation tape subsystem now under development at StorageTek using helical scan technology. This library based storage subsystem is designed for the high performance, deep archival market. The topics are presented in viewgraph form and include the following: subsystem overview, media standards, Redwood developed tape, D3 helical recording format, Redwood cartridge, host software for Redwood libraries, and market opportunities. Derived from text

N93-31980*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

ARCHITECTURAL ASSESSMENT OF MASS STORAGE SYSTEMS AT GSFC

M. Halem, J. Behnke, P. Pease, and N. Palm *In its* Goddard Conference on Mass Storage Systems and Technologies, Volume 2 1993 p 599-610 (For primary document see N93-31964 12-82)

Avail: CASI HC A03/MF A03

The topics are presented in viewgraph form and include the following: system functionality; characteristics; data sources; hardware/software systems; and performance assessments. Derived from text

N93-32048# Carnegie-Mellon Univ., Pittsburgh, PA. School of Computer Science.

VENARI/ML INTERFACES AND EXAMPLES

Jeannette M. Wing, Manuel Faehndrich, Nick Haines, Karen Kietzke, and Darrell Kindred Mar. 1993 55 p

(Contract F33615-90-C-1465; ARPA Order 7597)

(AD-A265416; CMU-CS-93-123) Avail: CASI HC A04/MF A01

Transactions are a well-known and fundamental control abstraction that arose from the database community. Application programmers can treat a sequence of operations as an atomic (all-or-nothing) unit and rely on the runtime environment to guarantee serializability of concurrent transactions and persistence of effects of committed transactions. In this report, we present interfaces, expressed in Standard ML, for creating and controlling transactions. Unlike other transaction-based high-level

programming languages such as Argus and Avalon, Venari/ML is the first to support multi-threaded transactions, where each transaction may have multiple threads of control executing within its scope. We present a set of simple examples that show how to use Venari/ML interfaces individually and also in some useful combinations. We also present a larger example of searching a database of BibTEX entries. This report is intended primarily for use by an SML programmer whose application requires transactional properties. DTIC

N93-32049# Carnegie-Mellon Univ., Pittsburgh, PA. School of Computer Science.

RESEARCH IN TRANSPARENT INFORMED PREFETCHING Status Report

R. H. Patterson and Garth A. Gibson Feb. 1993 15 p

(Contract F33615-90-C-1465; ARPA Order 7597)

(AD-A265417; CMU-CS-93-113) Avail: CASI HC A03/MF A01

This paper focuses on extending the power of caching and prefetching to reduce file read latencies by exploiting application level hints about future I/O accesses. We argue that systems that disclose high-level knowledge can transfer optimization information across module boundaries in a manner consistent with sound software engineering principles. Such Transparent Informed Prefetching (TIP) systems provide a technique for converting the high throughput of new technologies such as disk arrays and log-structured file systems into low latency for applications. Our preliminary experiments show that even without a high-throughput I/O subsystem TIP yields reduced execution time of up to 30% for applications obtaining data from a remote file server and up to 13% for applications obtaining data from a single local disk. These experiments indicate that greater performance benefits will be available when TIP is integrated with low level resource management policies and highly parallel I/O subsystems such as disk arrays. DTIC

N93-32167 International Bank for Reconstruction and Development, Washington, DC.

INFORMATION SYSTEMS STRATEGIES FOR PUBLIC FINANCIAL MANAGEMENT World Bank Discussion Paper

H. M. Davies, A. Hashim, and E. Talero 1993 58 p

(PB93-186948; WORLDBANK/DP-193) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

The paper develops a strategic framework for the network of systems required to support Public Financial Management (PFM) consisting of: (1) an information architecture; (2) a systems architecture; and (3) a technology architecture. To derive this framework, the paper uses a methodology that focuses on the business or functional processes within PFM rather than on the institutions that perform them. This ensures that the framework remains valid in spite of organizational changes, and that it can be used as an implementation roadmap over an extended period of time. The paper addresses questions such as: what are the scope, scale, and type of a particular area's system components; how do these elements interrelate; what are the major issues and options associated with the introduction of these systems; and where do the greatest problems and opportunities lie. The paper also discusses some factors that determine the choice of technology for the component modules of the PFM systems network and approaches to some implementation issues. NTIS

N93-32298# Los Alamos National Lab., NM. Computer Research Group.

MANIPULATING REMOTELY-SENSED DATA WITH KHOROS

P. M. Kelly and J. M. White 1993 9 p Presented at the Application Visualization System (AVS) 1993 Users Group Meeting, Orlando, FL, 24-26 May 1993

(Contract W-7405-eng-36)

(DE93-012622; LA-UR-93-1200; CONF-9305168-2) Avail: CASI HC A02/MF A01

Satellite image analysis typically requires the handling of very large data sets, and the amount of data which will be available from satellite sensors in the future is immense. In this paper, the authors describe two particular remote-sensing applications which they have approached using the Khoros system. The first application discussed is the clustering of large multispectral data sets for efficient analysis and classification. The second application is the automatic identification of urban areas using texture measures and various pattern recognition routines. They have installed a number of new routines into the Khoros environment for working on these projects. DOE

N93-32325 Toronto Univ. (Ontario).

PERSONAL INFORMATION MANAGEMENT IN COMPUTER SCIENCE RESEARCH Ph.D. Thesis

Anna Birgitta Olander 1992 227 p

(ISBN-0-315-73783-2) Avail: Univ. Microfilms Order No. DANN73783

Computer scientists' behavior as they seek and use information in their research was studied in order to identify personal characteristics in information management. The central research questions were: (1) how does a computer scientist manage the information that he or she uses in research and teaching; (2) what implications do personal and environmental characteristics have for the way individual computer scientists handle scholarly information; (3) what are the implications of personal information management for the provision of scholarly information to researchers in computer science. Qualitative research methods were chosen as the most suitable for assessing factors critical for information-seeking behavior. Nine computer science researchers in a Swedish university were studied. Each participant constituted a case. Information management was analyzed from the individual user's perspective. The study belongs to what Dervin and Nilan call the 'alternative paradigm' of information needs and uses research. Interviewing was the main instrument for data collection. The most important findings are that an analysis of the participants' information behavior has led to a typology, in matrix form, of different modes of information behavior. This matrix combines explicit and implicit information needs and internal and external information seeking into four sets of criteria: explicit needs/external seeking, explicit needs/internal seeking, implicit needs/external seeking, and implicit needs/internal seeking. The participants' information management is focused on satisfying implicit information needs through internal information seeking. Information provision to researchers like the participants must support this kind of information behavior. My study has also shown that the participants prefer colleagues over printed sources. Conference proceedings are the preferred printed sources. I have also found that the participants filter information input by exposing themselves only to the most relevant material. In order to adequately provide scholarly information to computer scientists like the participants, support for informal, internal information seeking and wide exposure to information should be developed. Methods for input filtering, evaluation support, and flexible access are required to facilitate personal information management geared to meet the implicit information needs that dominate in this user group.

Dissert. Abstr.

N93-32376* National Aeronautics and Space Administration, Washington, DC.

NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 2: INDEXES (SUPPLEMENT 43)

Jul. 1993 606 p

(NASA-SP-7039(43)-Sect-2; NAS 1.21:7039(43)-Sect-2) Avail: CASI HC A99

A subject index is provided for over 5400 patents and patent applications for the period May 1969 through June 1993. Additional indexes list personal authors, corporate authors, contract numbers, NASA case numbers, U.S. patent class numbers, U.S. patent numbers, and NASA accession numbers. Author

N93-32383 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.

IS TIME A REAL TIME? AN OVERVIEW OF TIME ONTOLOGY IN INFORMATICS

Fabio A. Schreiber Jul. 1992 27 p Sponsored in part by CNR-CSISEI, and Ministry of University and Research and Scientific Technology, Italy

(Rept-92-046; ETN-93-93985) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

Several aspects of time in the heterogeneous world of informatics are discussed. Ontologies for time in different domains of computers and their applications are defined. Philosophical and physical backgrounds are given. The purpose is to show how, from the richness of often contrasting ideas developed in the framework of these disciplines, many useful concepts were derived for computer science. Architectural aspects of computer

systems, information systems applications, and real time systems are considered as temporally problematic domains. ESA

N93-32389 Politecnico di Milano (Italy). Dipt. di Elettronica e Informazione.
KNOWLEDGE BASED DOCUMENT RETRIEVAL IN OFFICE ENVIRONMENTS: THE KABIRIA SYSTEM
A. Celentano, M. G. Fugini, and S. Pozzi May 1992 51 p
(Rept-92-032; ETN-93-93983) Avail: Issuing Activity (Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milan, Italy)

In the office environment, the retrieval of documents is performed using the concepts contained in the documents, the information about the procedural context where the documents are used, and the information about the regulations and laws that discipline the life of documents within a given application domain. To fulfill the requirements of such a retrieval, a document retrieval model and a system based on the representation of knowledge describing the semantic contents of documents are proposed. The way in which the documents are managed by procedures and by people in the office, and the application domain where the office operates are included. The knowledge representation issues needed for the document retrieval system is described and a document retrieval model that captures these issues is presented. The effectiveness of the approach is illustrated by describing a retrieval system, named Kabiria, built on top of such a model. The architecture of the system, the query language, and the browsing facilities are described. ESA

N93-32403*# National Aeronautics and Space Administration, Washington, DC.
COORDINATING COUNCIL. TENTH MEETING: INFORMATION RETRIEVAL: THE ROLE OF CONTROLLED VOCABULARIES
Apr. 1993 63 p Meeting held in Washington, DC, 22 Apr. 1993
(NASA-TM-108764; NAS 1.15:108764) Avail: CASI HC A04/MF A01

The theme of this NASA Scientific and Technical Information Program Coordinating Council meeting was the role of controlled vocabularies (thesauri) in information retrieval. Included are summaries of the presentations and the accompanying visuals. Dr. Raya Fidel addressed 'Retrieval: Free Text, Full Text, and Controlled Vocabularies.' Dr. Bella Hass Weinberg spoke on 'Controlled Vocabularies and Thesaurus Standards.' The presentations were followed by a panel discussion with participation from NASA, the National Library of Medicine, the Defense Technical Information Center, and the Department of Energy; this discussion, however, is not summarized in any detail in this document. CASI

N93-31713# Rutherford High Energy Lab., Chilton (England). Space Science Dept.
CO-ORDINATED DATA HANDLING FOR THE UK PARTICIPANTS IN THE CLUSTER MISSION
A. M. Cruise, L. J. Woolliscroft (Sheffield Univ., England.), E. Dunford, S. J. Schwartz (London Univ., England.), P. A. Vaughan, and E. Golton *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 275-277 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-32143*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
USING MACHINE LEARNING TECHNIQUES TO AUTOMATE SKY SURVEY CATALOG GENERATION
Usama M. Fayyad, J. C. Roden, R. J. Doyle, Nicholas Weir (California Inst. of Tech., Pasadena.), and S. G. Djorgovski (California Inst. of Tech., Pasadena.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 340-348 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32144*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INTELLIGENT ASSISTANCE IN SCIENTIFIC DATA PREPARATION
Steve Chien, R. Kirk Kandt, Joseph Roden, Richard J. Doyle, Scott Burleigh, Todd King (California Univ., Los Angeles.), and Steve Joy (California Univ., Los Angeles.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 349-354 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

N93-32150*# Illinois Univ., Urbana. Dept. of Computer Science.
PRODUCING APPROXIMATE ANSWERS TO DATABASE QUERIES
Susan V. Vrbsky and Jane W. S. Liu *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 398-405 Sponsored in part by ONR and AFOSR (For primary document see N93-32097 12-99)
(Contract NAG1-613; N00014-92-J-1146; AF-AFOSR-1-5-26932)
Avail: CASI HC A02/MF A04

N93-32153*# Maryland Univ., College Park. Dept. of Computer Science.
COOPERATIVE ANSWERS IN DATABASE SYSTEMS
Terry Gaasterland, Parke Godfrey, Jack Minker, and Lev Novik *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 418-425 Sponsored in part by AFOSR and NSF (For primary document see N93-32097 12-99)
(Grants AF-AFOSR-0350-91; NSF IRI-89-16059)
Avail: CASI HC A02/MF A04

N93-32155*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AUTOMATION AND HYPERMEDIA TECHNOLOGY APPLICATIONS
Joseph H. Jupin, Edward W. Ng, and Mark L. James *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 437-443 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see also *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N93-31045# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (Germany). Hubschrauber und Flugzeuge.
TECHNOLOGY TRANSFER: POTENTIAL OF BMFT CONCEPT FOR HYPERSONICS [TECHNOLOGIETRANSFER: OTENTIALE DES BMFT-FOERDERKONZEPTES HYPERSCHALLTECHNOLOGIE]
E. H. Hirschel, P. W. Sacher, P. Krammer (Motoren- und Turbinen-Union Muenchen G.m.b.H., Germany.), W. Uhse (Dornier System G.m.b.H.,

Friedrichshafen, Germany.), and F. Hormann (Deutsche Airbus G.m.b.H., Hamburg, Germany.) 22 Sep. 1992 16 p In GERMAN Presented at DGLR Deutsche Luft- und Raumfahrtkongress, Bremen, Germany, 29 Sep. - 2 Oct. 1992
(MBB-LME-202-S-PUB-0505; DGLR-92-03-087; ETN-93-94195) Avail: CASI HC A03/MF A01

The structure of the BFMT requirement concept for hypersonics technology is outlined. Objectives are presented in key technologies such as propulsion, aerothermodynamics, materials, structures, flight management, and subsystems, which are selected as a concept for the Saenger two stage space transportation system. Supercomputers, ground simulation facilities, and experimental flight instruments are the key technologies to be developed. The technology transfer potential is identified for each technology area. Possible addresses for technology transfer are presented and mechanisms for transmission of extracted technologies are discussed. ESA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio, gamma-ray, and infrared astronomy, and astrometry.

N93-31049# Tuebingen Univ. (Germany). Astronomisches Inst.
ROSAT OBSERVATIONS OF QUASAR 3C 273 Thesis [ROSAT-BEOBACHTUNGEN DES QUASARS 3C 273]
Kai Otterbein Sep. 1992 126 p In GERMAN Original contains color illustrations
(ETN-93-94202) Avail: CASI HC A07/MF A02

Three Rosat observations of the quasar 3C 273 environment are reported. The Rosat satellite is described, as well as observation instruments such as the x-ray telescope and its subsystems: x-ray mirror assembly, positive proportional sensitive counter and high resolution imagers, and wide field camera. The Extended Scientific Analysis System (ESAS) was used for data reduction. The ESAS is a software packet developed for Rosat. A source detection algorithm was applied to measured data. Variability behavior of 3C 273 was studied, and light curves were obtained. The curves show no periodicity of intensity oscillations after Fourier analysis. Low x-ray spectra were examined and modeled by a simple potential law. Radio-interferometric observations with a very long base interferometer allow the jet to be studied with high resolution and a superluminal motion to be discovered. ESA

N93-31604*# Hawaii Univ., Manoa. Inst. for Astronomy.
VISIBLE AND INFRARED INVESTIGATIONS OF PLANET-CROSSING ASTEROIDS AND OUTER SOLAR SYSTEM OBJECTS Final Technical Report, 1 Jan. 1990 - 31 Dec. 1991
David J. Tholen 31 Dec. 1991 5 p
(Grant NAGw-2019)
(NASA-CR-193511; NAS 1.26:193511) Avail: CASI HC A01/MF A01

A major effort was directed toward 951 Gaspra in preparation for the Galileo encounter in October 1991. Most of the observational work involved photometry, for purposes of investigating the rotational state and phase function of the asteroid to help plan the encounter, and for purposes of navigating the spacecraft to the object. Work was also done with radiometric data obtained with the IRTF at NASA's request, for which simultaneous visible photometry was acquired with the University of Hawaii 2.24-m telescope. The results from the observations made during the 1990 opposition were published by Goldader et al. The main results reported include a rotational period of 7.04246 hours, an absolute visual magnitude of 11.8026, a slope parameter of 0.285, an early estimate of a high obliquity, an infrared spectrum indicating an olivine-rich composition, and 13 astrometric positions. Author (revised)

N93-31750# European Space Agency, Paris (France).
TARGETS FOR SPACE-BASED INTERFEROMETRY
C. Mattok, comp. Dec. 1992 246 p Colloquium held in Beaulieu, France, 13-16 Oct. 1992; co-sponsored by Observatoire de la Cote d'Azur, France
(ESA-SP-354; ISBN-9-29-092234-6; ETN-93-93951) Copyright Avail: CASI HC A11/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Papers given at this colloquium which was organized in the context of the long-term planning of the so called 'green dreams' of ESA's space science program, Horizon 2000, are presented. The status and future plans of ground based interferometry are reviewed, and the various space projects under consideration are discussed. The driving scientific objectives unique to the development of a space based capability are identified and the possible strategies for interferometry in space are defined and discussed. For individual titles, see N93-31751 through N93-31789.

N93-31751# Observatoire de la Cote d'Azur, Nice (France).
THE NEED OF VERY ACCURATE OPTICAL ASTROMETRY BY INTERFEROMETRIC TECHNIQUES
Jean Kovalevsky *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 9-11 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The very great step forward allowed by the successful HIPPARCOS mission will bring global astrometry to a stage at which many new applications to astrophysics and galactic kinematics and dynamics will become possible. The state of some basic problems is reviewed as it is at present and as it should be after HIPPARCOS. However, in many aspects, the milliarc second accuracy is not always sufficient. Some examples are given. In particular, the link of the reference system to extragalactic sources, dynamics in the Magellanic clouds, the cosmic distance scale, mass determinations and search for unseen companions, are some of the major problems that should be addressed by space interferometry, aiming at 0.00001 arc second precision for 100 to 1000 stars. But a 'super-HIPPARCOS' working in a global astrometry mode and giving positions and yearly proper motions of several million stars with an accuracy of 0.0001 to 0.00001 arc second would represent also a major contribution to astrophysics and galactic astronomy. ESA

N93-31752# Harvard-Smithsonian Center for Astrophysics, Cambridge, MA.
ULTRAVIOLET IMAGING INTERFEROMETRY
A. K. Dupree *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 13-17 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The scientific advantages of imaging astronomical targets in the ultraviolet (wavelength 1200-3000) region of the spectrum are discussed. Experience with ultraviolet spectroscopy of objects using the International Ultraviolet Explorer (IUE) and Hubble Space Telescope (HST), and recent ultraviolet imaging from the Ultraviolet Imaging Telescope (UIT) on the Astro mission and HST, which combined with theoretical expectations has provided the basis to identify important scientific problems that can be addressed by imaging ultraviolet interferometry, is considered. The ultraviolet imaging of cool stars, globular clusters and galaxies, are discussed. Current achievements in ultraviolet imaging are summarized and the spatial resolution required for imaging elements in and around various stellar and extragalactic targets is given. It is concluded that examples of interest to ultraviolet imaging include imaging of stars and binary systems, dense cores of star clusters, and galactic nuclei and jets. ESA

N93-31753# Kitt Peak National Observatory, Tucson, AZ.
VISIBLE AND INFRARED IMAGING INTERFEROMETRY FROM SPACE
Stephen T. Ridgway *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 19-24 Sponsored in part by NSF (For primary document see N93-31750 12-89)
(Grant NATO-RG86/0080)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The considerable literature that has built up on the scietific objectives for interferometry and the performance of ground, space and lunar interferometers is summarized. While the expected performance of ground based systems is considerable, some areas appear reserved for space implementation. Areas in which space interferometry might be thought to offer an important advantage over the ground are addressed. Interesting opportunities for a first interferometry mission include precision astrometry, solar imaging of active galactic nuclei, stellar surfaces, and blue companions. ESA

N93-31754# Observatoire de Paris-Meudon (France).
SUBMILLIMETER INTERFEROMETRY
J. Leuqueux (Ecole Normale Superieure, Meudon, France.) and A. Harris (Max-Planck-Inst. fuer Extraterrestrische Physik, Garching, Germany.) *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 25-32 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The scientific objectives in the submillimeter range (30 micrometers to 1 mm) are considered with emphasis on interferometry. Possible designs for a large space submillimeter astronomical interferometer are discussed and a strategy for their implementation is defined. The preferred design is a single large antenna or very compact interferometer on a single mount, surrounded by other antennas. The large diameter instrument is important in its own right. It will also bridge the resolution gap between smaller spaceborne instruments and larger interferometers. A large submillimeter antenna might also be useful as an optical/IR speckle telescope. The alternative possibility of a static phased array distributed on the lunar surface was examined and it was found that it would require an impractically large number of elements. It is noted that a polar site on the Moon, although attractive in several respects, has the problem that objects in our solar system will always be very close to, or below the horizon. An obvious and necessary precursor of a space submillimeter interferometer is a spaceborne submillimeter telescope like FIRST. Critical areas requiring major research and development studies are defined. The astronomical goals for submillimeter interferometry include solar system, circumstellar envelopes, interstellar matter, star formation, extragalactic and cosmological topics. The most interesting goals require observations in the 60 to 300 micrometer range, an angular resolution of 0.1 to 1 inch, and a collecting surface of several hundred square meters. ESA

N93-31755# Observatoire de Paris-Meudon (France).
PROSPECTS FOR EARTH-BASED INTERFEROMETRY
Jean-Marie Mariotti *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 35-41 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The status of Earth based optical interferometry, its development and its principal achievements during the last decade are reviewed. The various operating interferometric facilities and projects are compared in terms of such factors as sensitivity, number of apertures, and beam combination mode. The future of ground-based interferometry is discussed versus space-based interferometry, in particular with respect to the rapid development of adaptive optics compensation of the atmospheric turbulence. ESA

N93-31756# Royal Signals and Radar Establishment, Malvern (England).
COMPARATIVE ASPECTS OF EARTH- AND SPACE-BASED INTERFEROMETRY
A. H. Greenaway *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 43-50 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The factors on which the comparison between space based and terrestrial interferometery should be based are addressed. The discussion is restricted to those frequencies for which the detection process may be modeled by photon counting. The main emphasis is placed on the question of comparative sensitivity and the extent to which the development of adaptive optics may change this in the coming decades. Consideration is also given to the impact that the choice between space based and Earth based observation has on the spatial frequency coverage and sky coverage achieved. The results of an examination of the signal to noise ratio associated with the determination of a target energy spectrum are presented in the appendix. ESA

N93-31757# College de France, Paris.
INTERFEROMETRY FROM THE MOON
Antoine Labeyrie *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 51-55 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Advantages and disadvantages of the Moon for the site for large optical interferometers as opposed to Earth orbits are addressed. The permanent darkness, in some polar craters, avoids the contamination of long, unprotected, coude beams by solar straylight. The optics in such sites can be cooled passively, as well as the detectors which may also be buried for protection against energetic particles. Long baselines, up to perhaps 10 km, may be possible. Unlike orbital sites, however, lunar sites require delicate optical delay lines or movable telescopes to deal with a substrate which cannot be rotated as desired for pointing various objects. This, and the automated deployment, is achieved with robotic walking telescopesin the case of the Lunar Optical Very Large Array (LOYLA) concept. The design principles, fine geometry control, optical structure, automated deployment, maintenance and power of lunar telescopes are discussed. LOYLA's scientific goals are considered. Among these is the lunar Optical Very Large Array concept - the imaging of exoplanets, with a few pixels of resolution on their disk in some cases. The construction of the ground based OVLA, which has a similar design and which may provide valuable operating experience, is also discussed. ESA

N93-31758*# Smithsonian Astrophysical Observatory, Cambridge, MA.
SPACE-BASED ASTROMETRIC OPTICAL INTERFEROMETRY WITH POINTS
R. D. Reasenberg, R. W. Babcock, J. D. Phillips, and M. C. Noecker *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 59-69 (For primary document see N93-31750 12-89)
(Grants NsG-7176; NAGw-1674; NAGw-1355; NAGw-2497)
Copyright Avail: CASI HC A03/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

POINTS, a dual space-based astrometric optical interferometer with nominal baseline length of 2 meters and measurement accuracy of 5 microarcseconds, which could be a powerful new multidisciplinary research tool is introduced. The instrument, including the laser gauges which are a central aspect of the instrument, are described. The design of the spacecraft, and the mission operations, including the bias determination and correction, are discussed. As a candidate for the Astrometric Interferometry Mission (AIM) mission, POINTS could open new areas of astrophysical research and change the nature of the questions being asked in some old areas. As a candidate for the TOPS-1 (Towards Other Planetary Systems) mission, it could be used to perform a definitive search for extra solar planetary systems, either finding and characterizing a large number of them or showing that they are far less numerous than now believed. POINTS, which is small, agile, and mechanically simple, would be the first of a new class of powerful instruments in space and would prove the technology for the larger members of that class to follow. ESA

N93-31759# Centre National de la Recherche Scientifique, Verrieres-Le Buisson (France). Service d'Aeronomie.
THE SUN/SIMURIS INTERFEROMETER
L. Dame *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 71-78 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The Solar Ultraviolet Network (SUN), which is a four 20 cm diameter telescope interferometer of 2 m baseline, is presented. SUN is the major instrument of the SIMURIS (Stellar Interferometric Mission for Ultrahigh Resolution Imaging and Spectroscopy) mission now under study by ESA for a possible accommodation on the Space Station Freedom. SUN concepts and optical, mechanical and thermal design are reviewed with emphasis on the unique particularities of this cophased interferometer dedicated to imaging of complex and extended objects. ESA

N93-31760# Massachusetts Inst. of Tech., Cambridge.
SEARCHING FOR EXOPLANETS
Bernard F. Burke *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 81-83 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The series of investigations which lead to the conclusion that a serious search for planets orbiting stars other than our Sun (exoplanets) is feasible, are reviewed. The expectation of a search and the means of direct and indirect detection that would be used are addressed. It is suggested that such a search should include the examination of the entire system of events leading up to the formation of a planetary system, and so the study of circumstellar material is an integral part of the study of exoplanetary systems. The search for exoplanets can start with groundbased means in this decade, and planets the size of Jupiter or Uranus should be detectable among nearby stars. The methods will necessarily be indirect, but planning can begin now for space missions that would have the capability of finding hundreds of examples of giant planets if they are as common as present work indicates. A negative result would be equally significant, indicating the need for a searching reevaluation of present ideas. Ultimately, direct detection and the study of planets, including Earth-like planets, should be possible, and early concept studies could start now. A three phase program, TOPS (Toward Other Planetary Systems) is presented. The first phase, TOPS-0, would concentrate on ground based activities, combined with preparatory work for the next phase, TOPS-1. In this phase, one or more space based missions would carry out an extensive search for exoplanets. In the third phase, TOPS-2, a major instrument that could detect Earth like planets directly would be developed. ESA

N93-31761# Kitt Peak National Observatory, Tucson, AZ.
SPACE INTERFEROMETRY SCIENCE WORKING GROUP
Stephen T. Ridgway *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 85-86 Sponsored in part by NSF (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Decisions taken by the astronomy and astrophysics survey committee and the interferometry panel which lead to the formation of the Space Interferometry Science Working Group (SISWG) are outlined. The SISWG was formed by the NASA astrophysics division to provide scientific and technical input from the community in planning for space interferometry and in support of an Astrometric Interferometry Mission (AIM). The AIM program hopes to measure the positions of astronomical objects with a precision of a few millionths of an arcsecond. The SISWG science and technical teams are described and the outcomes of its first meeting are given. ESA

N93-31762# Imperial Coll. of Science and Technology, London (England). Blackett Lab.
REPORT ON THE ESA INTERFEROMETRY STUDY TEAM ACTIVITIES
J. C. Dainty *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 87-88 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Activities of the ESA Interferometry Study Team leading directly to the organization of the colloquium entitled 'Targets for Space Based Interferometry' are summarized. The study team examined the scientific case for modest baselines, tried to predict how Earth based techniques might evolve and thus define the advantages of space over the ground for interferometry, and above all attempted to be as realistic as possible in terms of cost. Conclusions of the Lunar Interferometry Study Team (LIST), which addressed the scientific case for locating optical and submillimeter interferometers on the Moon, are outlined. The following conclusions are given: there is a very strong case for very high angular resolution imaging; in the long term the merits of long baseline interferometers in space and the Moon are clear but the costs appear enormous; in the visible and NIR, current advances in ground based techniques make it very difficult to select a medium term mission in space that has a clear scientific payoff compared to the ground; it is essential to coordinate ground and space based developments. ESA

N93-31763# European Southern Observatory, Garching (Germany).
THE VLT INTERFEROMETER: CURRENT STATUS AND EXPECTATIONS FOR THE NEXT 20 YEARS
M. Faucherre, B. Koehler, O. vonderLuehe, F. Merkle, and N. Zhu *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 91-98 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The layout, optical design and main components of the Very Large Telescope Interferometer (VLTI) are presented. VLTI subsystems are designed with sufficient flexibility to allow incorporation of new features later. Some parameters, which are of interest for a comparison between ground and space, are also presented: effective aperture diameter, depending on the degree of correction by adaptive optics (for 8 m Unit Telescopes (UTs) and 1.8 m Auxiliary Telescopes (ATs)); number of telescopes and (u, v) coverage possibilities; maximum size of the array (133/202 m with VIMA (VLTI Main Array)/VISA (VLTI Sub Array) respectively); wide field of view for off axis cophasing/coherencing (up to 8 arcsec field), thanks to the 'homothetic mapper'. In particular the size of the field of view has considerable impact on the scientific use of the VLTI and will be dealt with in more detail. After the year 2005, additional features may be available at the VLTI : four UTs and up to eight ATs and delay lines, with rapid reconfiguration of the array; partial adaptive optics at shorter wavelengths; blind operation by coherencing or cophasing from sources several arcmin away from axis; full sky coverage using laser guide stars for adaptive optics; cophasing of the array using in orbit artificial sources; and an extension of the VLTI towards the north of Paranal site. It is suggested that space programs in interferometry should complement large ground based facilities which will be operational by the first decade of the next century. ESA

N93-31764# Space Telescope Science Inst., Baltimore, MD.
SISTERS: A SPACE INTERFEROMETER FOR THE SEARCH FOR TERRESTRIAL EXO-PLANETS BY ROTATION SHEARING
P.-Y. Bely, C. J. Burrows, F. Roddier (Hawaii Univ., Honolulu.), G. Weigelt (Max-Planck-Inst. fuer Radioastronomie, Bonn, Germany.), and Marco C. Bernasconi (OURS Foundation, Embrach, Switzerland.) *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 99-103 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A concept for a space based interferometer dedicated to the detection of extrasolar Earth like planets is presented. Detection is done in the near infrared (10 micrometers) where the expected star to planet flux ratio is down to 1,000,000 compared to 10 to the 10th power in the visible. The longer wavelength also makes it easier to avoid light scatter due to optics microroughness. Parent star cancellation is obtained with a rotation shearing interferometer working at its null on axis. The interferometer is of the Fizeau configuration with an aperture composed of twelve 1.2 m mirrors on a 20 m ring. This size, which corresponds to a resolving power of 0.05 arcsecond, allows for the investigation of about 30 candidate stars. The interferometer is supported by a chemically rigidized structure deployed by inflation. All optical elements are passively cooled to about 70K to reduce the instrumental infrared background. The spacecraft is located at the second Lagrangian point of the Earth Sun system in order to minimize attitude control and baffling requirements. ESA

N93-31765# Ruhr Univ., Bochum (Germany). Astronomisches Inst.
THE INTERNATIONAL STRATOSPHERIC LABORATORY FOR ASTROPHYSICS (ISLA): THE COSMIC MICROSCOPE
G. F. O. Schnur, K.-H. Stenvers (Krupp Industrietechnik G.m.b.H., Duisburg, Germany.), R. Hanuschik, and K. Pausch (Krupp Industrietechnik G.m.b.H., Duisburg, Germany.) *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 105-110 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

ISLA (International Stratospheric Laboratory for Astrophysics) is proposed as an alternative to space based astronomical observatories. ISLA will be operated remotely at altitudes of about 14 km for extended periods of several weeks, after which it will be maintained and replenished at a mobile ground station. With a seeing less than or equal to 0.1 arcsec in the optical ISLA will permit to obtain diffraction limited telescopic observations

for all wavelengths greater than 0.3 micrometers with telescopes of the 4 m class. Due to the extremely low precipitable water vapor content remaining above ISLA infrared and submillimeter observations will be greatly facilitated. The Fried parameter size of several meters at ISLA altitudes compared to 10 cm at good ground sites makes interferometric observations easier by factors of 10,000 to 100,000 for the same signal to noise ratio. Some preliminary technical details are presented. It should become possible in the future to shift many observations from satellite observatories to ISLA, thus reducing the cost of satellites by very significant amounts. ESA

N93-31766# Grenoble-1 Univ. (France). Lab. d'Astrophysique.
IMAGING CIRCUMSTELLAR DISKS AROUND YOUNG STARS BY MULTI-APERTURE INTERFEROMETRY
F. Malbet, J.-L. Monin, and J. Bouvier *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 111-115 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Synthetic images of circumstellar accretion disks, computed from a model where the complete disk vertical structure is solved are presented. The emission processes in the disk are: thermal emission arising from accretion process, thermal emission due to reprocessing of stellar photons in the disk, and scattering of the stellar photons at the disk's surface. The images are discussed in the framework of multi-aperture interferometry. It is shown that scattering is easier to detect at short wavelengths while thermal emission is more easily detected at mid and far infrared wavelengths because of the smoother variation of the radial brightness profiles. The primary constraint for detecting thermal emission is spatial resolution while a high dynamical range is mandatory to detect scattered light. More precisely, exploring the structure of accretion disks requires interferometers with a spatial resolution of at least 2 mas for an intensity ratio of 100 in the midinfrared, that is, baselines ranging from 100 m to 1 km. Hence, groundbased, spacebased and lunarbased interferometers appear as complementary tools that will provide both the range of baselines and the high dynamical range required to probe the detailed physical structure of circumstellar disks around young stars. ESA

N93-31767# Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.
STUDY OF ISM TURBULENCE USING RADIOINTERFEROMETERS (NEW METHOD)
Alexander Lazarian *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 117-122 Sponsored by Isaac Newton Scholarship (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

An interferometric method used to study turbulence within HI disc of the galaxy, which is also applicable for the study of turbulence in the different phases of the Interstellar Medium (IM), is discussed. The influence of anisotropies in HI at large angular scales is considered and the solution of the inverse problem for the correlation functions of density is discussed. It is shown that characteristics of the 21 cm diffuse radiation which can be directly measured by a radiointerferometer correspond to the spectrum of the random density field. This result is extremely important for two reasons. For one thing, the resolution of the modern radiointerferometer is very high. Thus it is possible to study turbulence at smaller angular scale. For another thing, the radiointerferometer signal can be used directly, which is very convenient as this excludes laborious procedures such as an image reconstruction and the solution of an inverse problem. The method can be used to study turbulence with the present day equipment. Spacebased interferometers can enlarge the range of the objects where turbulence can be studied. ESA

N93-31768# Centre National de la Recherche Scientifique, Verrieres-Le Buisson (France). Service d'Aeronomie.
THE LUNAR INTERFEROMETER FOR SOLAR PHYSICS
L. Dame, M. Martic, J. Porteneuve, and G. F. O. Schnur (Ruhr Univ., Bochum, Germany.) *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 123-132 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The concept of a Lunar Interferometer for Solar Physics (LISP) is presented. The choice of a configuration for the imaging complex and the optical and mechanical design are discussed. Particular attention is paid to the rationale for a compact two dimensional array and the use of a novel mechanical support structure based on linear mounting rods is proposed. These two conceptual choices optimize imaging capacities and room and mass issues for transportation to the Moon. ESA

N93-31769# European Southern Observatory, Garching (Germany).
ADVANCED LUNAR-BASED INTERFEROMETER FOR SOLAR OBSERVATIONS
O. vonderLuehe *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 133-135 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

An update on a previous design study for an advanced lunar based solar observatory is presented. The original proposed configuration of 12 interferometer elements was found to be unnecessarily redundant and was revised to an 11 element configuration. The advantages of a lunar site are addressed. The new configuration and resulting UV coverage are presented. The eleven elements are arranged regularly such that the apertures are circumscribed by a 10 m diameter circle. The central spacing between elements is 2.2 m, resulting in an overlap of the autocorrelation between neighboring elements by 40 cm. This property results in a fully covered UV plane, and although the value of the array Modulation Transfer Function (MTF) may occasionally become quite small it never totally vanishes within the support area of approximately 10 m radius. Two representative cuts through the array MTF are illustrated. The MTF in the illustration has values around 0.10 throughout most of the high frequency region. Another illustration shows the corresponding cuts through the Point Spread Function (PSF) of the array. The PSF has sidelobes which are at most a factor 6.6 smaller than the central peak. ESA

N93-31770# Max-Planck-Inst. fuer Extraterrestrische Physik, Garching (Germany).
REPORT OF THE SUBMILLIMETER SPLINTER GROUP
A. I. Harris and J. Lequeux (Observatoire de Paris-Meudon, France.) *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 139-140 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The aim of the submillimeter splinter group of the LIST (Lunar Interferometry Study Team) was to examine the scientific and technical aspects of a submillimeter interferometer with an emphasis on heterodyne detection. The main elements of the scientific logic that lead to the conclusions that a heterodyne submillimeter array should have a collecting area of at order 1000 sq m are summarized. This conclusion is based on sensitivity constraints and the following points: anything that can be done from the ground, will be; an instrument as complex and expensive as a large submillimeter interferometer must be capable of significant extragalactic observations; and no matter what the future scientific trends are, looking at the main coolants will always be important. It is clear that an instrument of this size is several steps past the next generation of spaceborne observatories. ESA

N93-31771# Observatoire de Paris-Meudon (France).
ATOMIC AND MOLECULAR LINE OBSERVATIONS OF GALAXIES
Nguyen-Quang Rieu *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 141-144 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The study of the molecular interstellar medium in galaxies is discussed. This study used to be based on the observation of the ubiquitous CO emission at millimeter wavelengths. With the advent of large millimeter and submillimeter wave telescopes, molecular species much less abundant than CO such as HCN and the ion HCO(+) whose excitation requirements are more stringent than those of CO have been used to probe regions of high densities and temperatures in the vicinity of galactic nuclei. Images of molecular emission from galaxies observed with the IRAM interferometer have shown that the nuclear regions of starburst galaxies consist of individual clumps of the size of giant molecular clouds observed in the center of our Galaxy. Spectrometers on board the ISO satellite will give an opportunity of observing far infrared atomic fine structure and molecular lines in a

large number of galaxies. The observations of parent molecules together with their photodissociation products in a wide spectral band will provide severe constraints to models of physico-chemistry. ESA

N93-31772# Cambridge Univ. (England). Cavendish Lab.
SUBMILLIMETRE LINE OBSERVATIONS OF MOLECULAR CLOUDS
Rachael Padman *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 145-153 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The use of high resolution spectral line observations at millimeter and submillimeter wavelengths to determine the structure, kinematics and composition of molecular clouds is considered. Three key issues are addressed: small scale structure, the search for 'protostars' and 'protostellar disks', and the kinematics and dynamics of outflows from young stars. Thanks to telescopes such as the IRAM MRT, JCMT and CSO, submm spectral line observations at frequencies up to 500 GHz, and resolutions of 10 to 20 arcsec can be routinely made. For the three areas it is already apparent that still higher resolution is required. Targets for a possible space based interferometer, of unspecified resolution or collecting area are reviewed. Since such an instrument has not yet been flown, it is rather difficult to know what it will see, however, the sorts of science it might do, as informed by ground based observations at lower frequencies, by fleeting glimpses at low resolution from the KAO, and by current theoretical ideas, are described. For the benefit of non-millimeter wave astronomers a brief review of the observational basics concerning which lines should be observed and why, and the luminosity which they could be expected to have, is given. ESA

N93-31773# European Southern Observatory, Garching (Germany).
SUMMARY OF THE SPLINTER SESSION ON OPTICAL AND UV SCIENCE
Jacques M. Beckers *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 157-158 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The goal of the splinter group was to discuss the most prominent astrophysical objectives for a space based interferometer in the optical (UV, visible, near IR) domain. The discussion was organized around three main themes: solar system, stellar and galactic astrophysics, extragalactic astrophysics and cosmology. The scientific objectives and specifications for a space based solar interferometer, for an astrometric interferometer, and for a stellar interferometer, are given. Tentative conclusions for the splinter session are given. ESA

N93-31774# Sterrenwacht Sonnenborgh, Utrecht (Netherlands).
UV INTERFEROMETRY OF HOT STARS
Henny J. G. L. M. Lamers (Space Research Organization Netherlands, Utrecht.) *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 159-162 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The importance of UV interferometry at a resolution of about 3 milliarcseconds (MAS) down to a magnitude of about 15 for the study of hot stars is discussed with special attention being given to the winds of early type supergiants, the disks of Be stars, X-ray binaries and supercompact clusters. The number of objects to be resolved at this resolution is small (less than or equal to 20) but the information to be obtained is unique. Tables showing the following are presented: the relation between the radius of stars of different types and the distance to which these stars can be resolved at 3 mas resolution; the nearby hot supergiants with winds larger than 3 mas; three Be stars with disks that can be resolved; and the general characteristics of X-ray binaries. Studies of hot stars which can not be done at 3 mas are listed. ESA

N93-31775# Sterrenwacht Sonnenborgh, Utrecht (Netherlands).
HIGH RESOLUTION SOLAR PHYSICS **c92**
Robert J. Rutten *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 163-173 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A03/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The importance of high spatial resolution in the future of astrophysics, and in the revolutionization of solar physics, is addressed. The proximity of the Sun brings the enormous advantage that modest baselines suffice to fulfill an important goal: to resolve basic plasma processes at their characteristic scales. At such resolution, the solar atmosphere represents a plasma physics laboratory of broad interest. Concerted observations combining high spatial and temporal resolution with narrow band diagnostics in the ultraviolet and the visible will deliver detailed insights in plasma processes that are ubiquitous in the cosmos, but resolvable only for the Sun. Space interferometry is the obvious way to fulfill this promise and reasons for this are given. The space time resolution characteristics of solar phenomena and solar inspired paradigms of magnetohydrodynamics are considered together with the ground based resolution limit. ESA

N93-31776*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROSPECTS FOR IMAGING AND ASTROMETRY ON THE GROUND AND IMPLICATIONS FOR SPACE INTERFEROMETRY
M. Mark Colavita *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 177-181 Sponsored by NASA, Washington (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The potential imaging performance of large telescopes using adaptive optics with laser guide stars, and of interferometers using laser phased subapertures are considered. The potential astrometric performance from the ground is also discussed. For each case the implications for a space interferometry mission are considered. The advantages of the space environment for optical and infrared astronomical interferometry are: transparency at all wavelength bands, no atmospheric turbulence, and the ability to cool optics for observation in the thermal infrared. However, ground based interferometry also has important advantages: the availability of large apertures and long baselines and generally lower costs. While transparency and thermal emission are fundamental, adaptive optics aided by laser guide stars shows promise to eliminate some of the effects of turbulence for ground based imaging. Other techniques such as phase referencing and closure phase can also be used to circumvent some of the effects of atmospheric turbulence. While it is a long step from the theoretical performance predictions for a ground based instrument to their attainment, a future space imaging interferometer must emphasize those capabilities which are impossible or at least very difficult from the ground: UV observations, very high dynamic range measurements, or high resolution measurements of faint, extended objects. The case for space astrometry is more clear: while ground interferometry can offer high accuracies over very small fields, a space interferometer can offer more than two orders of magnitude better performance over wide fields than that achievable with groundbased systems. ESA

N93-31777# Academy of Sciences (USSR), Moscow. Astro-Space Center.
P CYG ENVELOPE AND PROSPECTS OF INTERFEROMETRIC OBSERVATIONS
M. S. Burgin and A. A. Chalabaev (Nice Univ., France.) *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 185-187 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The possible astrophysical output of high angular resolution observations in spectral lines of the gaseous envelope around P Cyg is discussed. The advantages of interferometry over spectroscopy, and of spaceborne interferometers over ground based instruments, are discussed. The computed effective radius of the P Cyg system (star + envelope) in the hydrogen H alpha line is presented, forming a qualitative basis for the discussion which follows. It appears that observations of the spatial intensity distribution in a spectral line are sensitive both to the temperature and density distributions in the envelope. Although fits to the intensity distribution are expected to be more informative than fits to spectral line profile, it is however, strongly desirable to have observational data in several atomic transitions, especially those sensitive to temperature. This would be of a greater help, disentangling the effects of the temperature and density structures. Some transitions can be observed from the ground, but other important transitions are in the far UV spectral range which justifies spaceborne experiments. ESA

N93-31778# National Tsing Hua Univ., Hsinchu (Taiwan). Dept. of Physics.

STUDY OF THE SECOND-ORDER RELATIVISTIC LIGHT DEFLECTION OF THE SUN USING LONG-BASELINE FIBRE-LINKED INTERFEROMETERS: LASER-INTERFEROMETRIC SOLAR RELATIVITY (LISOR) TEST

Wei-Tou Ni, Jow-Tsong Shy, Shiao-Min Tseng, and Michael Shao (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 189-195 (For primary document see N93-31750 12-89)

(Contract NSC-82-F-SP-007-02)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A propasal to study the second order light deflection in the solar gravitational field is presented. It is proposed to use 1 to 2 W frequency stabilized lasers on two microspacecraft about 0.25 degree apart in the sky with apparent positions near the Sun, and observe the relative angle of two spacecraft using ground based fiber linked interferometers with 10 km baseline to determine the second order relativistic light deflection effects. The first two years of work would emphasize the establishment of a prototype stabilized laser system and fiber linked interferometer. The first year, a prototype fiber linked interferometer would be set up to study the phase noise produced by external perturbations to fiber links. The second year, a second interferometer would be set up. The cancellation of phase drift due to fiber links of both interferometers in the same environment would be investigated. ESA

N93-31779# Nice Univ. (France). Dept. d'Astrophysique.

SPECTRO-IMAGERY WITH A ROTATING SLIP-APERTURE TELESCOPE (RSAT): COPHASING SUCCESSIVE PROJECTIONS IN THE RADON PLANE

H. Touma (Centre National de Coordination et de Planitification de la Recherche Scientifique et Technique, Rabat, Morocco.), S. Kadiri (Centre National de Coordination et de Planitification de la Recherche Scientifique et Technique, Rabat, Morocco.), F. Martin, C. Aime, J. Darcourt, and H. Lanteri *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 197-200 (For primary document see N93-31750 12-89)

Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The interest of a Rotating Slit Aperture Telescope (RSAT) among other synthetic aperture telescopes, its capability of being easily coupled with a spectrograph in order to give reconstructed images of an astronomical object as a function of the light wavelength, is discussed. The principle of image reconstruction is considered: it consists of the inversion of the set of projections (Radon transform) given by the telescope during its rotation. One of the main difficulties in the reconstruction process in space may come from the jitter of the rotation axis of the RSAT. A numerical simulation to study the effect of motion of the rotation axis is presented. For this goal, simulations of reconstructed images are given when the rotation axis is moved during the observation; two kinds of objects are considered: first, the object is a point source and secondly the object is a galaxy (M51). A possible way to overcome this limitation consists in the evaluation, in real time, of the motion of the axis of rotation by means of a very small secondary telescope. ESA

N93-31780# Centre National de la Recherche Scientifique, Verrieres-Le Buisson (France). Service d'Aeronomie.

STUDY OF AN OPTIMIZED CONFIGURATION FOR INTERFEROMETRIC IMAGING OF COMPLEX AND EXTENDED SOLAR STRUCTURES

L. Dame and M. Martic *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 201-208 (For primary document see N93-31750 12-89)

(Contract ESA-9301/91/NL/MS)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Assuring a given active control of the phase and pointing errors, image reconstruction by optical aperture synthesis of capabilities of the Solar Ultraviolet Network (SUN) interferometer, are simulated. The importance of a compact array configuration when imaging extended objects is shown and selected results of marginal and diluted interferometric configurations are presented. It was found that if phase and printing errors are kept reasonable (10 deg, wavelength/6, and 10 marcsec) by the active control system of SUN, image dynamics of 1000 or so can be envisaged on most of the active and complex structures of the Sun. ESA

N93-31781# Royal Signals and Radar Establishment, Malvern (England).

HIGH RESOLUTION IMAGING FROM THE GROUND USING A SATELLITE-BORNE LASER GUIDE STAR

C. J. Baddiley and A. H. Greenaway *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 209-211 (For primary document see N93-31750 12-89)

Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The PHAROS proposal to use a low power laser on a small satellite in an eccentric orbit as a wavefront reference for imaging in astronomy is examined. The question of wavefront curvature in the laser reference beam is specifically addressed and it is shown that this poses no insurmountable problems for the estimation of wavefront corrections to be applied to astronomical observations. Emphasis is on the use of the reference in the context of long baseline interferometry. In the context of terrestrial telescope arrays presently under construction, the likely imaging performance of these arrays and the sky coverage afforded by such a satellite reference, are investigated. ESA

N93-31782# Phillips Lab., Kirtland AFB, NM.

EXPLORING THE LIMITS OF ADAPTIVE WAVEFRONT COMPENSATION FOR GROUND BASED ASTRONOMICAL INTERFEROMETERS

G. C. Loos, J. S. Fender, and L. J. Otten, III *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 213-217 (For primary document see N93-31750 12-89)

Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Turbulence induced decorrelation of wavefronts received from distant astronomical sources severely limits the signal to noise ratio of the estimates of fringe visibility obtainable using uncompensated optical interferometers located on the surface of the Earth. Adaptive optics systems can be used to concentrate light in the fringe patterns with the consequence of improving the sensitivity and general utility of interferometric data acquisition. Calculations which predict the improvement(s) in detection sensitivity expressed in limiting detectable visual magnitude for a stellar interferometer equipped with a wavefront compensation system capable of widely varying degrees of spatial compensation are presented. Significant performance gains are shown to result from even modest levels of wavefront correction. Sensitivity enhancements associated with more complete correction may prove unattainable in practice with all but the brightest sources due to insufficient signal to noise in the wavefront sensor. ESA

N93-31783# Observatoire de Paris-Meudon (France).

INTEGRATED OPTICS FOR AN INTERFEROMETRIC LINK **c74**

V. CoudeduForesto, Stephen T. Ridgway (Kitt Peak National Observatory, Tucson, AZ.), and J.-M. Mariotti *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 219-224 (For primary document see N93-31750 12-89)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The advantages of integrated optics for space interferometry are addressed: it can elegantly perform optical functions, such as coherent beam recombination, in a package that presents minimum weight and volume, and the components can be considered as 'black boxes' that require little or no alignment once they are implemented. FLUOR (Fiber Linked Unit for Optical Recombination), a ground demonstrator unit that enabled a pair of two existing 0.8 m telescopes to be transformed into an interferometer with a 5.5 m baseline is presented. The heart of FLUOR is a single mode fluoride glass triple fiber coupler: one X-coupler performs the coherent beam correlation, and two Y-couplers are used to monitor the starlight injection fluctuations in the fibers at the focus of each telescope. These signals are used in data reduction for calibration of the interferograms. In the last observing campaign several stars were observed with a precision of less than a few percents on the visibility measurements. ESA

N93-31784# Observatoire de Paris-Meudon (France).

IR SINGLE-MODE FIBER OPTICS FOR DOUBLE FOURIER INTERFEROMETRY **c74**

Pei-Qian Zhao, J.-M. Mariotti, P. Lena, and V. CoudeduForesto *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 225-230 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The possibility and limitation of using IR single mode fiber optics for Double Fourier interferometry are investigated. Problems and effects, such as chromatic aberration of the Optical Path Difference (OPD) scan, and hence the chromatic aberration of the truncation, unequal interval sampling effects, polarization effects, resulted from the OPD scan by stretching optical fibers are analyzed and discussed. Calibration for the OPD scan and its accuracy are discussed. It is concluded that it is possible to stretch the optical fiber to realize the phase delay for Fourier Transform Spectroscopy (FTS) and double Fourier interferometry, particularly in the case of low spectral resolution, even though there exist some problems which are not encountered in the traditional FTS. The life span of the fiber may be lengthened by enhancing the fatigue strength of the fiber by means of coating the fiber with suitable material or by decreasing the maximum strain by means of prolong the operation length of the fiber on condition that the spectral resolution keep constant, but these problems should be analyzed further. In addition, it is not impossible to find another means to let the fiber be subjected to force which is beneficial to the improvement of the fatigue strength other than only tensile force. ESA

N93-31785# *Imperial Coll. of Science and Technology, London (England). Blackett Lab.*
INTERFEROMETRY AT THE VACUUM ULTRA-VIOLET LIMIT
A. P. Thorne, G. Cox, and R. C. M. Learner *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 231-234 Sponsored by Science Research Council and Royal Society (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The technical implications of the results obtained with a vacuum ultraviolet Fourier transform spectrometer in the wavelength region from 300 to 160 nm are reported. At present the VUV limit is set by the optical homogeneity of the MgF2 substrate. To extend the limit of VUV interferometry below 160 nm it will be necessary both to minimize the substrate thickness and to develop a test faciliity to enable improvement of the substrate material. Since index variations scale vary rapidly with wavelength, a test interferometer for the VUV region was designed. Both these improvements are essential if interferometry at wavelengths down to Lyman alpha is to be achieved. ESA

N93-31786# Space Telescope Science Inst., Baltimore, MD.
HARDI: A HIGH ANGULAR RESOLUTION DEPLOYABLE INTERFEROMETER
P.-Y. Bely (European Space Agency, Paris, France.), C. J. Burrows (European Space Agency, Paris, France.), F. Roddier (Hawaii Univ., Honolulu.), and G. Weigelt (Max-Planck-Inst. fuer Radioastronomie, Bonn, Germany.) *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 235-240 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A proposed orbiting interferometer covering the UV, visible and near IR spectral ranges is described, with attention being given to the optical configuration, active optics system, spacecraft structure, thermal control and orbit. With a 6 m baseline and a collecting area equivalent to about a 1.4 m diameter full aperture, this instrument is intended to offer significant improvements in resolution over the Hubble Space Telescope, and complement the new generation of ground based interferometers with much better limiting magnitude and spectral coverage. The interferometer is of the Fizeau type, a configuration which affords a large field for both science and guiding needs, as well as excellent UV throughput because of the small number of reflections. The aperture configuration is optimized for uniform u-v plane coverage with rotation around the line of sight. The interferometer is kept coaligned and cophased using a field star and an internal metrology system. The spacecraft is in a high Earth orbit to minimize thermal and mechanical disturbances and to maximize observing efficiency. ESA

N93-31787# College de France, Paris.
A CONCEPT OF DEPLOYABLE TETHERED INTERFEROMETER **c19**
P. Claudin and A. Labeyrie *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 241-245 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Spinning tethered structures can be deployed to kilometric sizes while providing a spiral path suitable for efficient aperture synthesis. Calculations of the dynamic behavior of a rigidified spinning interferometer which is composed of six tethered telescopes, are presented. A static test made with the telescope suspended on wires is described. Using six cables per telescope, it appeared possible to control such structures with the accuracy required for interferometry. With its operational advantages, the concept is considered an attractive candidate for large interferometers in space. ESA

N93-31788# College de France, Paris.
INTERFEROMETER CONCEPTS FOR ASTROMETRY IN SPACE **c19**
Antoine Labeyrie *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 247-250 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The concepts of several interferometers, which can be built inside a tubular truss and be used according to the principle of the Hipparcos satellite, are described. Measuring the apparent angular spacing of star pairs, as required for wide angle astrometry, has been achieved by either pointing the stars sequentially or observing pairs of them simultaneously. The first method requires accurate divided circles on the instrument's mount, a stable pier carrying the instrument, and a good knowledge of the pier's diurnal rotation. The second method requires an internal prism or roof mirror system with fixed and known angle. An advantage in this case is that the instrument's pointing direction does not have to be accurately known. There is no need for a stable pier with known diurnal rotation. The Hipparcos satellite gave a successful illustration of the second method. The principle of the Hipparcos satellite, namely the measurement of angular distances between pairs of stars seen in different directions, has proved suitable for determining stellar positions with excellent accuracies. The extension of this principle to deployable space frames carrying optical elements which can observe simultaneously in a number of directions is also considered. ESA

N93-31789# Observatoire de Paris-Meudon (France).
PROSPECTS FOR STELLAR PHYSICS: STRUCTURE AND INFLUENCE OF CIRCUMSTELLAR MEDIA
Jean-Pierre J. Lafon *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 265-269 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The physical processes at work in circumstellar envelopes at various distances from the star surface are discussed. The circumstellar envelopes appear as structures in which conditions determinant both for stellar and interstellar evolution take place. The angular resolution required to observe their effects is looked into and five examples which illustrate how increased angular resolution could improve knowledge about star envelopes are given. These examples concern evolved stars, Be stars, binary stars, luminous blue variables, and the Orion region. High angular resolution at large wavelengths already allows improved modelization of their inner layers, between the photosphere and the interstellar medium. However, the same spatial resolution cannot be reached at all wavelengths and this is an important drawback concerning the consistence of the mechanical, thermodynamical, chemical mechanisms invoked to explain the complex structures which involve many phenomena, on highly different time scales and size scales. It is concluded that space interferometry could open new doors towards domains in which ground observations are limited, like in the ultraviolet range. ESA

N93-31990# Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
THE APPLICATION OF SYNTHETIC-BEACON TECHNOLOGY TO ASTRONOMY
Ronald R. Parenti and Richard J. Sasiela 17 Mar. 1993 110 p

(Contract F19628-90-C-0002)
(AD-A265146; TR-966; ESC-TR-92-132) Avail: CASI HC A06/MF A02

The application of adaptive optics technology to laser-beam control has been under investigation within the military community since the early 1970s. This work has encompassed a wide range of theoretical investigations as well as an impressive suite of laboratory and field experiments. During this period, a number of real-time systems incorporating several hundred degrees of freedom have been built and tested, and the technology to extend this number by at least an order of magnitude is now under development. To exploit adaptive-optics concepts in the construction of astronomical telescopes, the budgetary restrictions under which this field of research operates must be considered and improvements in system performance must be carefully balanced against equipment complexity, reliability, and cost. To accomplish this design trade-off, a set of concise analytic models describing the essential properties of a laser guide-star phase-conjugation system has been assembled. With the aid of these models, an optimization strategy for mating adaptive optics to a 4-m-class optical telescope has been developed; research shows that such a system might be expected to improve the effective atmospheric seeing conditions by nearly a factor of 10 within the isoplanatic patch of the turbulence probe. DTIC

N93-32160# Smithsonian Institution, Cambridge, MA. Astrophysical Observatory.
THE APPLICATION OF TWO-DIMENSIONAL IMAGING TO VERY HIGH ENERGY GAMMA RAY ASTRONOMY
T. C. Weekes Dec. 1992 22 p
(Contract DE-FG02-91ER-40635)
(DE93-012326; DOE/ER-40635/1) Avail: CASI HC A03/MF A01

After an introductory overview of gamma-ray astronomy, very brief summaries of research results are given. Summary topics may be grouped as follows: observations (survey of candidate gamma-ray sources; Cygnus X-3; Markarian 421; AGN's: general survey; Crab observations: pulsar outburst), Geminga, AE Aqr, bursts, ARTEMIS, muon telescope, technical developments (11m telescope: dedication and performance; 10-m mount control; CCD cameras; light cones; filters; GRANITE upgrade; trigger configuration; mirror coatings; lightning protection), data analysis (quick look; optical disk archive; false source method), infrastructure, and reviews. DOE

N93-32324*# Radiophysics, Inc., Boulder, CO.
USER FRIENDLY DATABASE FOR NEPTUNE PLANETARY RADIO ASTRONOMY OBSERVATIONS Final Report
David R. Evans 12 Jul. 1993 13 p
(Contract NASw-4699)
(NASA-CR-193261; NAS 1.26:193261) Avail: CASI HC A03/MF A01

Planetary Radio Astronomy (PRA) data from the Voyager Neptune encounter were cleaned and reformatted in a variety of formats. Most of these formats are new and have been specifically designed to provide easy access and use of the data without the need to understand esoteric characteristics of the PRA instrument or the Voyager spacecraft. Several data sets were submitted to the Planetary Data System (PDS) and have either appeared already on peer reviewed CDROM's or are in the process of being reviewed for inclusion in forthcoming CD-ROM's. Many of the data sets are also available online electronically through computer networks; it is anticipated that as time permits, the PDS will make all the data sets that were a part of this contract available both online and on CD-ROM's. Author (revised)

N93-32363*# Smithsonian Astrophysical Observatory, Cambridge, MA.
DEVELOPMENT OF HIGH RESOLUTION IMAGING DETECTORS FOR X RAY ASTRONOMY Final Report, 1 May 1982 - 30 Jun. 1991
S. S. Murray and D. A. Schwartz Apr. 1992 8 p
(Grant NAG5-605)
(NASA-CR-193653; NAS 1.26:193653) Avail: CASI HC A02/MF A01

This final report summarizes our past activities and discusses the work performed over the period of 1 April 1990 through 1 April 1991 on x-ray optics, soft x-ray (0.1 - 10 KeV) imaging detectors, and hard x-ray (10 - 300 KeV) imaging detectors. If microchannel plates (MCPs) can be used to focus x-rays with a high efficiency and good angular resolution, they will revolutionize the field of x-ray optics. An x-ray image of a point source through an array of square MCP pores compared favorably with our ray tracing model for the MCP. Initial analysis of this image demonstrates the feasibility of MCPs for soft x-rays. Our work continues with optimizing the performance of our soft x-ray MCP imaging detectors. This work involves readout technology that should provide improved MCP readout devices (thin film crossed grid, curved, and resistive sheets), defect removal in MCPs, and photocathode optimization. In the area of hard x-ray detector development we have developed two different techniques for producing a CsI photocathode thickness of 10 to 100 microns, such that it is thick enough to absorb the high energy x-rays and still allow the photoelectrons to escape to the top MCP of a modified soft x-ray imaging detector. The methods involve vacuum depositing a thick film of CsI on a strong back, and producing a converter device that takes the place of the photocathode. Derived from text

90 ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

For related information see also 75 Plasma Physics.

N93-31050# Tuebingen Univ. (Germany). Astronomisches Inst.
MOLECULES IN THE ENVELOPE OF PLANETARY NEBULAE WITH THE EXAMPLE OF CO-ENVELOPE OF M2-9 Thesis [MOLEKUELE IN DEN HUELLEN PLANETARISCHER NEBEL AM BEISPIEL DER CO-HUELLE VON M2-9]
Norbert Doll Feb. 1992 130 p In GERMAN Original contains color illustrations
(ETN-93-94203) Avail: CASI HC A07/MF A02

Star evolution and interrelations between dust and molecules in planetary nebulae are studied. Models for the development of asymptotic giant branches from the Hayashi line were presented and discussed, and mass loss through stellar wind was explained. The morphology of planetary nebulae was described with reference to their border geometry and internal halos: spherical, elliptic, and 'butterfly'. The nonspherical density distribution of the red giant envelope is assumed to be caused by star rotation or magnetic field existence. Homomolecular and heteromolecular homogeneous condensation theories for dust formation are given. Chemical blocking is explained, which is due to the high binding energy of CO molecule. CO infrared emission measurement results are presented such as SiO, OH, and H2O laser emission data. Some aspects of very long baseline interferometry and synthetic aperture are depicted, such as calibration, the u v w coordinate system, and Fourier analysis. Photoplanetary bipolar nebula M2-9 was observed in the CO(J equal to 1,0) line, with a millimeter wavelength interferometer. It is concluded that M2-9 is a very young planetary nebula, mainly consisting of dust and CO molecules. ESA

N93-31073# International Centre for Theoretical Physics, Trieste (Italy).
PERIODIC X RAY FLARES OF NGC 6814: GRAVITATIONAL LENSING OF AN ACCRETING NEUTRON STAR?
S. K. Chakrabarti and G. Bao (International School for Advanced Studies, Trieste, Italy.) Jun. 1992 6 p
(DE92-642586; IC-92/115) Avail: CASI HC A02/MF A01 (US Sales Only)

NGC 6814 shows approximately 12,200s periodicity in ME x-ray light curve of the EXOSAT observation. Recently, it has been suggested that this behavior is due to the gravitational lensing of a bright spot orbiting very closely around a supermassive black hole. It is proposed that the 'bright spot' is a neutron star accreting supercritically from the disk around the central black hole. The loss of orbital angular momentum of the neutron star due to gravitational radiation is supplied by the matter accreted onto it. The parameters are: mass of the central black hole is approximately 9.2 x 10(exp 6) solar mass, the mass of the neutron star orbiting at six Schwarzschild radius of the central black hole is 0.4 solar mass. The intrinsic luminosity of the supercritically accreting neutron star turns out to be approximately 6.4 x 10(exp 40) ergs/sec. DOE

N93-31091# Ludwig-Maximilians-Univ., Munich (Germany). Fakultaet fuer Physik.

FREQUENCY OF THE CHEMICAL ELEMENTS IN B-STARS OF THE LOCAL FIELD AND DISPERSION OF INTERSTELLAR MEDIUM Ph.D. Thesis [HAEUFIGKEIT DER CHEMISCHEN ELEMENTE IN B-STERNEN DES LOKALEN FELDES UND DIE DURCHMISCHUNG DES INTERSTELLAREN MEDIUMS]

Judith Kilian-Montenbruck Jul. 1991 116 p In GERMAN

(Contract DFG-GE490/4)

(ETN-93-94205) Avail: CASI HC A06/MF A02

Chemical distributions are estimated in twenty-one main line B stars with high resolution echelle spectra in order to study star development and interstellar medium composition. Effective temperature, gravity acceleration, microturbulence, and absolute frequency were accurately calculated by using spectrum models which take into account possible dampings of the local thermodynamic equilibrium by line development. It is shown that microturbulence increases with star development advance and cannot be neglected in the calculations. Above average nitrogen distributions were discovered. This shows that mass can be transported from the Carbon Nitrogen Oxygen (CNO) cycle to the star center in the atmosphere. ESA

N93-31153 Indiana Univ., Bloomington.

STRUCTURE, EVOLUTION, AND STABILITY OF ROTATING PROTOSTARS Ph.D. Thesis

Shelby Xiaobing Yang 1992 161 p

Avail: Univ. Microfilms Order No. DA9310230

It is widely believed that young stars (protostars) are formed in dark, dense molecular clouds in which gravitational forces cannot be balanced by gas pressure. Clumps in such clouds may undergo 'inside out' collapse to form central protostellar equilibrium cores. With an initial rotation, the collapsing gas first forms a slowly rotating core. As material with greater specific angular momentum collapses later, an equatorial disk around the core develops. A study of protostellar core models at this stage shows that three important events in the evolution of a protostellar core always occur in the same temporal order. First the core surpasses the limit above which overall uniform rotation is impossible; then the accretion flow streamlines begin to form a massive disk; and finally the star/disk structure becomes unstable to the growth of nonaxisymmetric structures. By means of 3P hydrodynamics simulations, the stability of protostellar cores is further investigated. Rapid exponential growth of nonaxisymmetric structures is detected in a model in which a Keplerian disk has just formed. An $m = 1$ mode dominates during the evolution. The driving mechanism of the nonaxisymmetric structure appears to be the amplification of density waves. A second-order 3D hydrodynamics code with self-gravity is developed and used for the study of protostellar core stability. Dissert. Abstr.

N93-31624# Swedish Inst. of Space Physics, Kiruna.

METEOR IMPACTS, SPORADIC E LAYER FORMATION AND THE INCOHERENT SCATTER METHOD

Asta Pellinen-Wannberg Sep. 1992 20 p

(IRF-SF-210; ETN-93-94209) Avail: CASI HC A03/MF A01

A study using incoherent scatter measurements during strong meteor showers, which addresses the many physical processes needed on the way for meteors to thin layers consisting of metals or alkali metals in the ionospheric E region, is reviewed. Meteors are considered to deposit elements which are layered into a broad metallic belt in the ionospheric E region extending over the whole Earth. Occasionally very thin and strong layers of, for example, iron or magnesium ions or sodium atoms appear. There exist several theories for thin layer compression from these elements, but none of them is fully satisfactory in explaining all the observations. The incoherent scatter method is efficient for studying the ion layers and their properties. The neutral layers cannot be detected by this method, but meteors can be observed. Radio waves reflect in different ways from head on collisions with meteors and the diffusing long lived ionized columns after meteor impacts. The possibility of identifying meteor head echoes from EISCAT data is discussed. ESA

N93-31674# European Space Agency, Paris (France).

STUDY OF THE SOLAR-TERRESTRIAL SYSTEM

James J. Hunt, comp. Sep. 1992 327 p The 26th ESLAB symposium was held in Killarney, Ireland, 16-19 Jun. 1992; sponsored by Inter-Agency Consultative Group for Space Science, and Scientific Committee on Solar-Terrestrial Physics

(ESA-SP-346; ISBN-9-29-092226-5; ETN-93-93944) Copyright Avail: CASI HC A15/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

This symposium dealt with the physics of solar-terrestrial relationships and formed part of the preparations of the Solar Terrestrial Program (STSP), which combines and brings together two missions: SOHO, which will investigate the Sun itself and its influence within the heliosphere, and CLUSTER, which will simultaneously investigate plasma physical processes in the context of the near Earth environment. Papers concerning the following are presented: energy storage in magnetic field; partially ionized plasma regions; flux tube dynamics and stability collisionless shocks; transport and dissipation at magnetic boundaries; magnetic field reconnection; gradual and explosive energy releases in the magnetosphere; and flows and mass ejections in the solar atmosphere. For individual titles, see N93-31675 through N93-31726.

N93-31675# Tokyo Univ. (Japan). Inst. of Space and Astronautical Science.

COORDINATION OF THE SOLAR TERRESTRIAL SCIENCE BY THE IACG: INTER-AGENCY CONSULTATIVE GROUP FOR SPACE SCIENCE

A. Nishida *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 9-10 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The structure, missions, campaigns, and mode of operation of IACG, are addressed. The science projects of the four member agencies are subdivided into core missions, complementary missions, and missions with spacecraft in heliospheric orbits. The core missions are Geotail, Wind, Polar, Interball, SOHO, and CLUSTER. The campaigns discussed, which will be conducted from late 1993 onwards, include the following: 'magnetotail energy flow and the role of nonlinear dynamics,' 'boundaries in collisionless plasma,' and 'solar events and their manifestations in geospace'. ESA

N93-31676# Saint Andrew's Univ. (Scotland). Dept. of Mathematical Sciences.

SOLAR CORONAL MAGNETIC STRUCTURE **c92**

E. R. Priest *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 13-19 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A03/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The solar corona, which has a four fold structure of coronal loops, coronal holes, X-ray bright points, and prominences, is introduced. Recent developments in the theory for heating the corona, including a self consistent magnetohydrodynamic turbulence mechanism and new ways of creating current sheets by shearing force free fields or collapsing X-points, are reviewed. Prominences may be formed in huge flux tubes in response to flux cancellations at the photosphere, and flares may result from a magnetic catastrophe. ESA

N93-31677# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (Germany). Inst. fuer Extraterrestrische Physik.

MOMENTUM TRANSPORT THROUGH THE CHROMOSPHERE **c92**

Gerhard Haerendel *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 23-29 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

With regard to solar plasma dynamics, the following topics are discussed: similarities and differences in the ionosphere; transmission of shear stress through the chromosphere; and the support of cold and dense chromospheric matter inside the hot and dilute corona against gravity. The chromosphere and ionosphere have in common that they contain weakly ionized plasmas. There are other similarities, but also strong differences. A most important one lies in the ratio of neutral ion coupling time to the propagation time of an Alfven wave through the respective regions. In the ionosphere this ratio is large, in the chromosphere it is very small. This has the consequence that only AC Pedersen currents exist in the latter region. Their properties are derived and their role for chromospheric heating and lifting of cool and dense plasma out of the chromosphere into the corona, to form spicules, is discussed. At the lower edge of the chromosphere, the temperature minimum region, electron-neutral collisions dominate ohmic resistivity. The related magnetic diffusivity sets a lower limit to the tranverse scale of current filaments on the order of 50 km. Twisted flux tubes with l

approximately equal to 10(exp 9) A can, however, exist. They can store substantial energy, up to 6 x 10(exp 27) ergs, and current dissipation in chromosphere and below can give rise to visible brightening such as faculae and filigree. ESA

N93-31678# Hungarian Academy of Sciences, Budapest. Research Inst. for Particle and Nuclear Physics.

THE STRUCTURE OF THE DAYSIDE BOUNDARY LAYER BETWEEN THE VENUS IONOSPHERE AND THE SHOCKED SOLAR WIND **c92**

K. Szego, Z. Dobe, W. C. Knudsen (Knudsen Geophysical Branch, Monte Sereno, CA.), A. F. Nagy (Michigan Univ., Ann Arbor.), V. D. Shapiro (California Univ., La Jolla.), and V. I. Shevchenko (California Univ., La Jolla.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 31-36 (For primary document see N93-31674 12-90)

(Grants US-HUN-35/90; OTKA-1813)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A physical mechanism that may explain the observations at the boundary layer between the magnetosheath and the dayside ionosphere of nonmagnetic planets was investigated. The mechanism is based on a beam particle type interaction between the shocked solar wind and cold planetary ions. Some of the consequences of these interaction processes were established using Pioneer-Venus Orbiter and Phobos-2 observations. However, the identification of the accelerated electrons in the case of Venus eluded detection. ESA

N93-31679# Utrecht State Univ. (Netherlands). Sterrenkundig Inst.

RETARDATION EFFECTS AND THE ORIGIN OF FILAMENT OSCILLATIONS **c92**

M. Kuperus and G. H. J. vandenOord *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 39-41 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The temporal evolution of a coronal current filament in terms of the mirror current concept is studied, taking into account the effect of time retardation when a filament, originally in equilibrium, starts rising. A filament current subject to a perturbation experiences the photospheric boundary an Alfven bounce time later. This retardation effect gives rise to an extra force which causes the filament to oscillate around an equilibrium position, emitting Alfven waves which damp the filament oscillations. The onset of filament oscillations is a natural consequence of the presence of the inert photospheric boundary and the finite Alfven speed. Numerical simulations that show the evolution of a filament in a bipolar magnetic field as the filament current slowly increases are presented. The emission of waves during this evolution is an important energy source for the coronal heating. ESA

N93-31680*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

DISTINCT ION POPULATION IN THE POLAR CUSP: POSSIBLE SIGNATURE OF TRANSIENT RECONNECTION **c46**

C. P. Escoubet (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands.), M. F. Smith, and J. M. Bosqued (Centre d'Etude Spatiale des Rayonnements, Toulouse, France.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 43-48 Sponsored in part by CNES, and ESA (For primary document see N93-31674 12-90)

(Contract NAGw-1638; NAS5-31207)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Observations of ion energy dispersion, a common feature of the polar cusp, are discussed. Normally these dispersions show a continuous decrease in energy. However, they occasionally show steplike features in the dispersion. On 15 Oct. 1981, Dynamics Explorer 2 (DE 2) crossed the polar cusp at 1015 MLT and observed three distinct ion populations as the spacecraft moved poleward. These three populations had peak flux energy around 2.7 keV, 850 eV, and 360 eV. The first step coincided with a rotation of the flow; the flow being directed westward on the equatorward edge, poleward in the center, and eastward on the poleward edge. The second and third stems showed a flow directed principally poleward. Furthermore, the magnetic and electric perturbations in the first step are well fitted by an elongated Flux Transfer Event (FTE) footprint model. These results suggest that three consecutive FTE's have injected solar wind plasma into the ionosphere forming the polar cusp. The small latitudinal size of these FTE footprints (approximately 40 km) and their short recurrence rate (3 and 6 min) would be consistent with an intermittent reconnection taking place at the subsolar point in a short time scale. ESA

N93-31681*# Southwest Research Inst., San Antonio, TX.

CORONAL SHOCK WAVES **c92**

Richard S. Steinolfson *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 51-57 (For primary document see N93-31674 12-90)

(Grants NAGw-2087; NAGw-2779)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The formation of magnetohydrodynamic (MHD) shocks near the leading edge of Coronal Mass Ejections (CME's) is considered using results from both shock theory and numerical simulations. By using just the shock theory results and a simplified model corona, the following is shown: a slow shock front should be concave upward (away from the solar surface); a configuration containing intermediate shocks should also be concave upward near the center of the CME and concave downward at some distance from the CME centerline; and a fast shock configuration should be concave downward. These results are verified with numerical simulations of the MHD equations for the propagation of shocks through a quiescent coronal streamer. By examining the characteristic wave speeds in the ambient streamer, it is estimated that the various shock configurations should form for CME speeds within the following speed increments: slow shocks, 200 to 300 km/sec; intermediate shocks, 300 to 900 km/sec; and fast shocks, greater than 900 km/sec. ESA

N93-31682# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (Germany). Inst. fuer Extraterrestrische Physik.

QUASI-PARALLEL SHOCK RE-FORMATION: TWO-DIMENSIONAL SIMULATIONS **c75**

M. Scholer, M. Fujimoto (Nagoya Univ., Japan.), and H. Kucharek *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 59-63 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Two dimensional hybrid (particle ions, massless fluid electrons) simulations are carried out in order to study the reformation process of quasi-parallel collisionless shocks. Results from a run with Alfven Mach number equal to 4.6 and angle, theta(sub beta-eta-omicron), between the average shock normal and the upstream magnetic field of 30 deg are reported. Reformation is in many cases due to steepening of upstream waves into pulsations as they are convected in the region of increasing diffuse ion density immediately upstream of the shock ramp: the upstream edge of the pulsation becomes ultimately the reformed shock. The upstream low frequency waves have their wave vectors aligned with the magnetic field, and the coherence length is about 40 ion inertial lengths. When the waves are convected into the region of increasing diffuse ion density the wave vectors are refracted into the shock normal direction. This leads to reformation which is more or less in phase along the shock front. ESA

N93-31683# London Univ. (England). Astronomy Unit.

ION ACCELERATION AT PARALLEL SHOCKS: SELF-CONSISTENT PLASMA SIMULATIONS **c75**

J. Giacalone, D. Burgess, and S. J. Schwartz *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 65-70 (For primary document see N93-31674 12-90)

(Grant SERC-GR/H09454)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The acceleration of ions by a collisionless shock wave is addressed. Shocks which propagate in the same direction as the average magnetic field are considered. This method utilizes self consistent plasma simulations which effectively models the initial acceleration of thermal plasma particles (the extraction process), the subsequent scattering off of the upstream and downstream turbulence (Fermi acceleration), local drift acceleration episodes at the shock front, and the feedback effect of the energetic particles in the overall behavior of the shock. The hybrid simulation model is employed which treats the ions individually and the electrons as a

massless, charge neutralizing fluid. To improve statistics at high energy, where the distribution function falls off readily, a particle splitting algorithm is used. Moreover, a spectrum of Alfvenic turbulence in the background magnetic field is introduced. This mimics the role of turbulence upstream of shocks in scattering backstreaming particles as part of the Fermi process. The results are qualitatively compared with observations. Means for achieving direct comparisons are discussed. ESA

N93-31684*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

PLASMA WAVE PHENOMENA OBSERVED AT INTERPLANETARY SHOCKS BY THE ULYSSES URAP EXPERIMENT c75

D. Lengyel-Frey (Maryland Univ., College Park.), R. J. MacDowall, R. G. Stone, S. Hoang (Observatoire de Paris-Meudon, France.), F. Pantellini (Observatoire de Paris-Meudon, France.), P. Canu (Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux, France.), N. Cornilleau-Wehrlin (Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux, France.), A. Balogh (Imperial Coll. of Science and Technology, London, England.), and R. Forsyth (Imperial Coll. of Science and Technology, London, England.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 71-76 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Results of a study of 24 interplanetary shocks observed by the Unified Radio and Plasma Wave Experiment (URAP) on the Ulysses spacecraft are presented. These shocks, observed between approximately 1 and 4 AU, display a variety of wave phenomena similar to those detected in earlier studies of shocks near 1 AU. The correspondence of the observed low frequency magnetic and electric field waves with the parallel index of refraction for whistler waves was investigated. Observed B/E ratios are found to be typically about a factor of 0.7 times the computed index of refraction, supporting the whistler interpretation of these waves, but also implying a prevalent electrostatic wave component which may be due to whistlers propagating at an angle to the interplanetary magnetic field. A statistical correlation of the amplitudes of the various types of waves with shock and solar wind properties is presented. ESA

N93-31685# National Oceanic and Atmospheric Administration, Boulder, CO. Space Environment Lab.

HELIOSPHERIC CURRENT SHEET EFFECTS ON THE PROPAGATION OF SOLAR-GENERATED SHOCK WAVES c92

M. Dryer, S. T. Wu (Alabama Univ., Huntsville.), C. C. Wu (Alabama Univ., Huntsville.), and S. M. Han (Tennessee Technological Univ., Cookeville.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 77-79 (For primary document see N93-31674 12-90)

(Contract NOAA/SEL-50RANR000104)

Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A fully three Dimensional (3D), time dependent, Magnetohydrodynamic (MHD) Interplanetary Global Model (3D IGM) is used to investigate the effect of a flat Heliospheric Current Sheet (HCS) on the propagation of solar flare generated shock waves and the structures behind them. Velocity profiles in the meridional plane are discussed; these profiles suggest the presence of a complex sequence of products following the fast, forward interplanetary shocks' interaction with HCS. A fast rarefaction wave may be one of the products of this interaction process. This wave may move, antisunward, faster than the shock itself, thereby explaining the signal's earlier arrival at the observer's position when compared with signals arriving from higher latitude flares. The analysis procedure is summarized, results are given, and concluding remarks are presented. ESA

N93-31686# Kiel Univ. (Germany). Inst. fuer Reine und Angewandte Kernphysik.

INFLUENCE OF INTERPLANETARY SHOCKS ON APPROXIMATELY 10 MeV PROTONS: A PHENOMENOLOGICAL CLASSIFICATION c92

May-Britt Kallenrode and G. Wibberenz *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 81-86 (For primary document see N93-31674 12-90)

(Contract DFG-Wi259/8)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

In a statistical approach, the influence of interplanetary shocks on approximately 10 MeV protons for 357 interplanetary shocks observed by the solar wind and magnetic field instruments on Helios 1 and 2 during the time interval Dec. 1974 to Dec. 1983 was analyzed. Three basic reactions of energetic particles in a shock can be distinguished: no increase in particle intensity above quiet or increased background (42 percent); a slow and long lasting rise in intensity without evidence for particles accelerated previously, for example in a solar flare (22 percent); and an increase in particle intensity on a high background intensity (classical Energetic Storm Particle (ESP) event, 28 percent). From the first two reactions, it was concluded that a preaccelerated particle component is neither a necessary nor a sufficient condition for the occurrence of an ESP event. In addition, the shock 'strength' alone, as described for example by the Mach number or the compression ratio, does not order these events. However, there is evidence that with increasing shock strength the energetic particles react stronger (higher intensities and harder spectra) to the shock. ESA

N93-31687# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (Germany). Inst. fuer Extraterrestrische Physik.

A NEW METHOD FOR MEASURING THE SPEED OF THE BOW SHOCK

Norbert Sckopke and Rudolf Treumann *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 87-89 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A method for estimating the speed of the quasi-perpendicular bow shock from single spacecraft data, based on timing the passage of the shock ramp and of the electron foreshock boundary plus an assumption on the shape of shock surface, is introduced. The Earth's bow shocks respond to changes in the upstream solar wind parameters with rapid motions from one equilibrium position to the next. But the shock also oscillates about its equilibrium position when the wind appears to be steady. Thus, crossings of the bow shock by a spacecraft are more often caused by the shock moving past the observer, with speeds of tens of kilometers per second, than by the spacecraft moving with its orbital speed of approximately 1 km/s past the immobile shock. The shock speed must be known if length scales are to be derived from the appropriate time series of plasma or field parameters and its knowledge is equally important for studies of the dynamical behavior of the shock. The method for estimating the speed of the bow shock is introduced, details are given elsewhere. ESA

N93-31688# Astrophysical Inst., Potsdam (Germany).

ON SHORT LARGE AMPLITUDE MAGNETIC STRUCTURES IN THE VICINITY OF THE QUASI-PARALLEL REGION OF THE EARTH'S BOW SHOCK

G. Mann and H. Luehr (Technische Univ., Brunswick, Germany.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 91-93 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Using the data of the magnetic field measurements on board the AMPTE/IRM satellite, Short Large Amplitude Magnetic Structures (SLAMS) occurring upstream of the bow shock are statistically investigated. The data analysis and results of these investigations are presented. The SLAMS have typical magnetic amplitudes of 2.6 times the undisturbed field. Within the SLAMS, the magnetic field swings from a quasi-parallel into a quasi-perpendicular geometry. Thus, thermalization processes well known from quasi-perpendicular shocks can locally act in the SLAMS's. Therefore, SLAMS can be regarded as elementary structures of a quasi parallel collisionless shock transition. ESA

N93-31689# Academy of Sciences (USSR), Moscow. Space Research Inst.

ENERGETICS OF ULF/ELF PLASMA WAVES IN THE SOLAR WIND AND OUTER EARTH'S MAGNETOSPHERE c75

S. I. Klimov *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 95-100 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Studies of ULF/ELF waves (0.1 to 100 Hz) in both quiet and disturbed magnetospheric conditions during the high apogee orbits of the Prognoz 8

(1980) and Prognoz 10 (1985) satellites and the low noise level of electric field, magnetic field, and plasma flux fluctuation instruments, are discussed. Direct measurements in the solar wind in the ULF/ELF range of fluctuation spectra of electric field E and ion component of plasma flux P showed that hourly averaged E and F spectra are in quiet conditions for E = 0.0001 to 0.000001 V/mHz (2 to 105 Hz) and for F = (1,000,000 to 10,000) counts/cm s Hz (2 to 70 Hz). In the disturbed conditions (on the sector boundaries and discontinuities), hourly averaged values of power spectral density are 2:3 times higher than in quiet regions. It was shown that most of the solar wind energy dissipation in the bow shock front is provided by the oscillations in the Doppler shifted lower hybrid frequency range (5 to 30 Hz) 10(exp -11) erg/cu cm rather than by ionosound oscillations 10(exp -15) erg/cu cm. ESA

N93-31690# Academy of Sciences (USSR), Moscow. Space Research Inst.

ULF/ELF ELECTROMAGNETIC WAVES ASSOCIATED WITH THE QUASIPERPENDICULAR EARTH'S BOW SHOCK CROSSINGS c75

M. N. Nozdrachev and A. A. Petrukovich *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 101-106 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The analysis of electromagnetic turbulence in the frequency range 0.1 to 75 Hz, associated with crossings of the Earth's bow shock recorded by the Prognoz 8 and 10 satellites, is reported. The quasi-monochromatic waves are identified in the shock transition region. Their frequencies, which lie in the range from 2 to 6 Hz upstream the shock ramp, shift to the values less than 1 Hz in the downstream region. The amplitudes of these narrow emissions are high enough to provide the dissipation in the flow of the solar wind plasma. It is argued that spectra shapes in this frequency range 0.1 to 75 Hz are strongly affected by the Doppler shift. ESA

N93-31691# Space Technology Ireland Ltd., Maynooth.

ENERGETIC PARTICLES (GREATER THAN 34 KeV - 3.2 MeV) IN THE DEEP MARTIAN MAGNETOTAIL (X = 15.5 R(SUB M)), MODELING OF THE MARTIAN BOW SHOCK AND THE INFLUENCE OF LOW SOLAR WIND PRESSURE ON MARS AS AN OBSTACLE c91

S. M. P. McKenna-Lawlor and V. V. Afonin (Academy of Sciences, USSR, Moscow.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 107-111 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The first observations of energetic particles (range greater than 34 KeV to less than 3.2 MeV) in the tailward part of the Martian magnetosheath, as well as during crossings of the Martian bow shock within the deep magnetotail (X = 15.5 R(sub M)), are reported. This was done by using data from the SLED (Solar Low Energy Detector) instrument on Phobos 2. The energies observed cannot be attained by the pickup process acting alone. Sporadic field line merging at the dayside of the planet would conceivably accelerate the particles to the observed energies. The presence of an unusually weak dynamic solar wind pressure during orbits 3 and 4 suggests that a weak intrinsic field could have expanded outwards under these conditions to provide a dayside obstacle radius for Mars of up to about 2000 km. ESA

N93-31692# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (Germany). Inst. fuer Extraterrestrische Physik.

PLASMA TRANSPORT THROUGH MAGNETIC BOUNDARIES c75

R. A. Treumann (Dartmouth Coll., Hanover, NH.), J. LaBelle (Dartmouth Coll., Hanover, NH.), and R. Pottelette (Centre National d'Etudes des Telecommunications, Saint Maur des Fosses, France.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 115-125 Sponsored in part by Dartmouth Coll. and PROCOPE (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A03/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The overall plasma diffusion processes across tangential discontinuities, of which the best known example is the Earth's magnetopause during northward interplanetary magnetic field conditions, are examined. The existence of the Low Latitude Boundary Layer (LLBL) adjacent to the magnetopause during those periods is ample evidence for the presence of entry processes acting at the magnetopause. It is concluded that microscopic instabilities are probably not efficient enough to account for the LLBL. They affect only a small number of resonant particles. It is argued that macroscopic nonresonant turbulence is the most probable mechanism for plasma transport. ESA

N93-31693# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).

CAN ULF FLUCTUATIONS OBSERVED AT THE MAGNETOPAUSE PLAY A ROLE IN ANOMALOUS DIFFUSION?

L. Rezeau, A. Roux, and C. T. Russell (California Univ., Los Angeles.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 127-131 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The corrrelations between the position of the magnetopause, the direction of its motion, and the level of Ultra Low Frequency (ULF) fluctuations observed close to this boundary, are studied. Data collected during successive crossings of the magnetopause by the International Sun-Earth Explorer (ISEE) are used to show that when the magnetopause is compressed by the solar wind, there is a high level of ULF fluctuations together with an earthward flux of ions through the boundary; however, when the magnetosphere is expanding the level of ULF fluctuations is lower and there is no inward flux. This suggests that the fluctuations play a significant role in the penetration of solar wind particles through the magnetopause. This case study is extended to other days when multiple magnetopause crossings are observed by ISEE. The role of the position of the magnetopause (absolute distance from Earth) and the possible presence of large scale surface waves are also discussed. ESA

N93-31694# Rutherford High Energy Lab., Chilton (England).

EXPLORING THE MAGNETOSPHERIC BOUNDARY LAYER

M. A. Hapgood and D. A. Bryant *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 133-138 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The construction of a 'transition parameter' based on electron density and temperature, which orders independent plasma measurements into well defined patterns which are consistent from case to case, is shown. It is concluded that there is a gradual change in the balance of processes which determine the structure of the layer and it is suggested that there is no advantage in dividing the layer into different regions. It is further concluded that the mixing processes in the layer act in an organized way to give the consistent patterns revealed by the transition parameter. More active processes must sometimes take place to give the extreme values (for example in velocity) which are seen in some crossings. ESA

N93-31695# Sussex Univ., Brighton (England). Astronomy Centre.

RECONNECTION IN THE SOLAR CORONA c92

M. Jardine *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 141-149 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Magnetic reconnection is a process of fundamental importance in the solar corona. The nature of the magnetic field structures at which reconnection takes place and how observations demonstrate that such structures are commonplace in the solar corona are reviewed. It is shown how the local environment influences the energy conversion that takes place during reconnection and how time dependent effects can be incorporated. Numerical experiments that can bring together these two aspects and insights that these have brought to the understanding of this process are discussed. The areas in which CLUSTER and SOHO will make the greatest contribution to studies of reconnection are outlined. ESA

N93-31696# Saint Andrew's Univ. (Scotland). Dept. of Mathematical and Computational Sciences.

MAGNETIC FIELD RECONNECTION AT THE DAYSIDE MAGNETOPAUSE

R. P. Rijnbeek *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 151-160 Sponsored by United Kingdom Science and Engineering

Research Council (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The development of a physical model of the magnetic field reconnection at the dayside magnetosphere is addressed. A mathematical model is also presented, and a comparison with observations is made. Magnetic field reconnection is a fundamental energy conversion process, and the energy liberated during this process gives rise to phenomena which can be observed in space and laboratory plasmas. At the dayside, magnetopause reconnection results in a coupling between the solar wind and the magnetosphere. Manifestations of this include large disturbances in the magnetic field, known as flux transfer events, and accelerated plasma flow along the magnetopause. ESA

N93-31697# Leningrad State Univ. (USSR). Inst. of Physics.
TIME-VARYING RECONNECTION IN A STAGNATION-POINT FLOW GEOMETRY **c75**
V. S. Semenov, B. P. Besser (Academy of Sciences, Graz, Austria.), H. K. Biernat (Academy of Sciences, Graz, Austria.), and G. A. Bachmaier (Academy of Sciences, Graz, Austria.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 161-164 Sponsored in part by Fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A magnetohydrodynamic model of time varying driven reconnection is presented. The plasma flow is of two dimensional, time dependent, stagnation point character. The initial magnetic fields are antiparallel on either side of the current sheet. Reconnection is initiated at the stagnation point and leads to the generation of regions which connect the magnetic fields between the inflow regions. The time and space behavior of the so called field reversal region (or outflow region) is studied analytically on the basis of a thin boundary layer model. ESA

N93-31698# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (Germany). Inst. fuer Extraterrestrische Physik.
COLLISIONLESS MAGNETOTAIL RECONNECTION AND SUBSTORMS
Joerg Buechner *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 165-175 (For primary document see N93-31674 12-90)
(Contract DARA-50-QN-9102-3)
Copyright Avail: CASI HC A03/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The physical conditions in the substorm relevant parts of the magnetotail are considered. The current understanding of reconnection in the collisionless tail plasma is surveyed. These conditions are compared with the tail observations, separately for thin current sheets, typical for the near Earth tail, for thick sheets, as observed in the mid-tail prior to substorms, and for the distant tail. The results are summarized. ESA

N93-31699# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (Germany).
OBSERVATION OF PARTICLE BURSTS IN THE TAIL OF PLANET MARS ONBOARD THE PHOBOS 2 SPACECRAFT **c91**
E. Kirsch, S. McKenna-Lawlor (Saint Patrick's Coll., Maynooth, Ireland.), V. V. Afonin (Academy of Sciences, USSR, Moscow.), K. Schwingenschuh (Institut fuer Weltraumforschung, Graz, Austria.), E. Keppler, M. Witte, D. OSullivan (Dublin Inst. for Advanced Studies, Ireland.), and A. Thompson (Dublin Inst. for Advanced Studies, Ireland.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 177-180 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Particle and magnetic field measurements obtained onboard the Phobos 2 spacecraft near planet Mars in Feb./Mar. 1989 are used to study particle bursts generated in the tail of Mars. The Phobos 2 spacecraft reached planet Mars on 29 Jan. 1989 and performed elliptical and circular orbits until 26 Mar. 1989. Especially during the circular orbits, particle bursts (E(sub p) = 35 to 200 keV) were observed by the Solar Low Energy Detector (SLED) in the tail region of Mars. Simultaneously, the magnetic field was measured by the MAGMA experiment. It was found that the particle bursts appeared during short term directional changes of the B(sub x) component which can be interpreted as an indication of the formation on an X-line. The bursts appear to be similar to those found in the geomagnetic field and are likely to have originated by reconnection processes in the Mars tail. ESA

N93-31700# Tokyo Univ. (Japan). Inst. of Space and Astronomical Science.
MAGNETOSPHERIC CONVECTION AND CURRENT SYSTEM IN THE DAYSIDE POLAR CAP
A. Nishida, T. Mukai, K. Tsuruda, and H. Hayakawa *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 183-192 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

New information on convection and current systems in the dayside polar cap, obtained through field and particle observations on EXOS-D (Akebono), is summarized and discussed in the context of previously published phenomenological models and interpretations. It was found that convection patterns are distinctly different depending upon whether the Interplanetary Magnetic Field (IMF) B(sub z) is northward or southward. The number of convection cells is two when B(sub z) is southward, but four when B(sub z) is northward. Lobe cells in which plasma flows sunward in the region of open field lines are observed as a pair (of which one is in the dawn and the other in the disk sector) for any polarity of IMF B(sub y) and B(sub z). Ions in the keV range precipitate not only in the dayside cusp region, but also along the sunward directed streamlines of the dawn and dusk lobe cells. These observations require reconsideration on the position and the extent of the reconnection region in the magnetopause. They also suggest that the magnetotail plays a vital role in some phenomena which have been ascribed to dayside magnetopause processes. No evidence was found to prove the presence of the viscous cell under southward IMF. ESA

N93-31701# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (Germany).
ON THE SOLAR WIND-MAGNETOSPHERE-IONOSPHERE COUPLING: AMPTE/CCE PARTICLE DATA AND THE AE INDICES **c92**
I. A. Daglis, E. T. Sarris (Thrace Univ., Xanthe, Greece.), G. Kremser (Oulu Univ., Finland.), and B. Wilken *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 193-198 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A statistical study of the substorm particle energization in terms of the energy density of the major magnetospheric ions (H(+), O(+), He(++), and He(+)) is presented. The particle data came from the CHEM (CHarge-Energy-Mass) spectrometer onboard the AMPTE/CCE (Active Magnetospheric Particle Trace Explorer/Charge Composition Explorer). The correlation between energy density during substorm expansion phase and the auroral indices (AE, AU, and AL) is examined and interpreted. The most distinct result is that the ionospheric origin O(+) energy density correlates remarkably well with the AE index, while the solar wind origin He(++) energy density does not correlate at all with AE. Mixed origin H(+) and He(+) ions exhibit an intermediate behavior. Furthermore, the O(+) energy density correlates very well with the pre-onset AU index level, while there is no correlation with the pre-onset AL index. The results are interpreted as a result of solar wind magnetosphere ionosphere coupling through the internal magnetospheric dynamo: the ionosphere responds to the increased activity of the internal dynamo (which is due to the high solar wind input) and influences substorm dynamics by feeding the near Earth magnetotail with energetic ionospheric ions during late growth phase and expansion phase. ESA

N93-31702# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (Germany).
ORIGIN OF THE SOLAR WIND AND CORONAL MASS EJECTIONS **c92**
Rainer Schwenn *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 205-206 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Theories on the origin of solar wind, theories that are derived from Parker's first theory on the existence and evolution of solar wind, are

discussed. It is suggested that knowledge on how the corona is heated would lead to insight into the problem of solar wind acceleration. From observations of solar wind stream structure through almost three solar activity cycles, four different types of solar wind and their respective coronal sources have been discerned. Each of these are discussed: high speed wind in highspeed streams, low speed wind of the 'interstream' type, low speed wind of the 'maximum' type, and coronal mass ejecta following interplanetary shocks. For each type of solar wind, the following parameters are given: high speed, low density, low particle flux, helium content, and source. A list of the most urgent questions in context with the solar wind origin is given. ESA

N93-31703# Rutherford High Energy Lab., Chilton (England).
DETECTING AND TRACKING CHANGES IN SOLAR WIND CONDITIONS USING INTERPLANETARY SCINTILLATION **c92**
Richard A. Harrison, M. A. Hapgood, and D. G. Sime (National Center for Atmospheric Research, Boulder, CO.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 207-209 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A scintillation activity index which provides an objective method for the identification of interplanetary features such as discrete ejecta and corotating streams was developed. Its effectiveness in predicting several sudden impulse events and correlating with geomagnetic activity is demonstrated. Using the Interplanetary Scintillation (IPS) activity index, I35, a data set during Feb. to Apr. 1992 was examined. A good correlation between the activity seen in interplanetary space and geomagnetic activity was found. Apparently, the onset of the most significant event in the geomagnetic index, Ap, is observed several days earlier using the IPS technique. Also, using a prediction technique developed for the IPS index, an 'event approaching' was predicted on six days, all of which occur on either the day of a sudden impulse or within the three days prior to a sudden impulse. One IPS event apparently unrelated to Ap or sudden impulse activity was found. This is proposed to be due to an event missing the Earth or to an event with a northward directed magnetic field which is unlikely to cause a significant impulse to the Earth's magnetic field. ESA

N93-31704# Oslo Univ. (Norway). Inst. of Theoretical Astrophysics.
MULTIPLE FLOWS IN THE SOLAR TRANSITION REGION **c92**
P. Brekke, N. Brynildsen, O. Kjeldseth-Moe, P. Maltby, and G. E. Brueckner (Naval Research Lab., Washington, DC.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 211-216 Sponsored by Norwegian Research Council for Science and the Humanities (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Observations of the solar transition region between the chromosphere and the corona using the High Resolution Telescope and Spectrograph (HRTS) are addressed. The HRTS is described together with the data reduction and calibration. The derivation of line profiles is considered. The solar transition region shows clear evidence of a fine scale structure that is much smaller than the best available instrumental resolution in the UV of 1 by 1 arcsec. Previous studies have suggested filling factors of 0.01 to 0.001, with the solar gas being restricted to thin extended fibrills. New evidence of the fine scale structure is found from its dynamical characteristics, the presence of multiple flows. In multiple flows, the solar gas in small volumes shows several distinct velocities, resulting in line profiles with more than one velocity component within the spatial resolution element. Multiple velocities are particularly prominent above sunspots, but by no means restricted to these regions. Instead they are clearly a general feature in the solar transition region, occurring in quiet as well as active regions. The observation of multiple velocities makes it clear that the transition region can no longer be regarded as static or even as stationary. ESA

N93-31705# Academy of Sciences (USSR), Moscow. Space Research Inst.
MASS, MOMENTUM AND ENERGY TRANSPORT FROM THE SUN TO THE EARTH BY DIFFERENT TYPES OF THE SOLAR WIND: PROGNOZ 7 OBSERVATIONS **c92**
Y. I. Yermolaev *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 217-222 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

On the basis of Magnetohydrodynamic (MHD) parameters measured on board the Prognoz 7 satellite, five different types of solar wind streams were selected and the variations of several MHD parameters in different streams were studied. A high ratio of ion thermal to magnetic pressures is often observed in Heliospheric Current Sheet (HCS) and the streams formed during coronal mass ejections. In quasi-stationary streams (that is, in streams from coronal streamers and holes) momentum fluxes are equal, and momentum flux increases in the streams disturbed by nonstationary coronal events and in HCS. Thermal and kinetic ion energy flux in disturbed streams and HCS is higher by 2 to 3 times than in quasi-stationary streams. Nevertheless, on the whole the Sun's loss of thermal and kinetic energy in streams from coronal holes is higher than in HCS, disturbed streams, and in streams from coronal streamers. ESA

N93-31706# Rutherford High Energy Lab., Chilton (England). Space Science Div.
SOLAR WIND PENETRATION TO GEOSTATIONARY ALTITUDE DURING THE MARCH 1991 MAGNETIC STORM **c92**
M. Grande, C. H. Perry, J. B. Blake (Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau, Germany.), J. F. Fennell (Aerospace Corp., Los Angeles, CA.), B. Wilken (Aerospace Corp., Los Angeles, CA.), and S. Livi *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 223-228 (For primary document see N93-31674 12-90)
(Contract F04701-88-C-0089; AF-AFOSR-85-0237)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Using the Magnetospheric Ion Composition Spectrometer (MICS) on the Combined Release and Radiation Effects Satellite (CRRES), high charge state magnetospheric ions in the energy range 20 to 400 keV/Q, believed to be originally solar wind materials, were examined. During the solar storm of Mar. 1991 a considerable increase in the numbers of alpha particles, Fe, Si, and other species, was seen. Moreover the relative abundances of the more massive species change relative to alpha particles on two occasions. Simultaneous changes in their charge states are seen. For example, in the case of iron, charge peaks around 9 and 16 and swings between the dominent charge state can be recognized. The swings in other species' charge state are consistent with a change in source temperature from 1,100,000 to 2,500,000 K as expected for different streams of coronal origin. It is clear that this material is trapped within the magnetosphere, which suggests that, not only has there been an abrupt change between fast and slow stream material, but also that this signature has penetrated promptly to geostationary altitude. This hypothesis is to some extent confirmed by data from the GOES7 satellite, which shows evidence of a flux tube impinging on the magnetosphere during the main period of high charge state material. However, this period is also characterized by high ring current activity, as evidenced by large negative D(sub st), which might provide an alternative explanation for the charge state changes although this is viewed as unlikely given the ionization rates for iron. ESA

N93-31707*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
MODEL OF A ROTATING MAGNETIC CLOUD
C. J. Farrugia, V. A. Osherovich (Hughes STX, Inc., Lanham, MD.), and L. F. Burlaga *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 231-236 Sponsored in part by USRA (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The possibility that magnetic clouds rotate while they propagate antisunward was investigated. Magnetic clouds are modeled as magnetic flux ropes which rotate rigidly about the axis of symmetry. An ideal magnetohydrodynamic model, in which the evolution of the magnetic structure is related to the time evolution of the angular frequency, is developed. A class of 'separable' magnetic fields is employed to reduce the problem to a nonlinear ordinary differential equation for the evolution function, and it is solved numerically. The corresponding effective potential gives rise to two modes of evolution--expansion and oscillation--depending on the energy and on the value of a dimensionless parameter, k. Parameter

k depends on the gas pressure, the ratio of the magnetic field components, and the frequency of rotation. There is a critical value of k, k(sub c), above which the oscillatory regime disappears and the flux rope invariably expands, regardless of the energy. Below k(sub c) the energy determines whether the configuration is confined or unbounded. Rotation always helps expansion by lowering the potential barrier. A data example was studied and features which are interpreted as signatures of rotation are presented. The angular speed is comparable to the Alfven speed, and the core of the rotating cloud completes on average one full revolution every three days at 1 AU. The parameter k is calculated from observations, and it is found to be close to, but below, critical. Only three out of the nine clouds examined showed signatures of rotation. Theoretical analysis suggests that close to the Sun rotation effects may play a more important role in the evolution of magnetic clouds than 1 AU. ESA

N93-31708# Sheffield Univ. (England).
THE IMPLEMENTATION OF THE DIGITAL WAVE PROCESSOR FOR THE ESA/NASA CLUSTER MISSION **c92**
L. J. C. Woolliscroft, H. S. C. Alleyne, C. Dunford, A. Sumner, J. A. Thompson, and K. H. Yearby *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 243-248 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The design and implementation of the Digital Wave Processor (DWP), which provides commanding control and data handling to the Wave Experiment Consortium (WEC), the name given to the complex of instruments to be carried on the ESA/NASA Cluster spacecraft, are described. The DWP architecture and its fault tolerant implementation are described. Timing and synchronization of the WEC measurements is important for the correlative studies which are essential for the Cluster mission. DWP also has macro-commanding facilities to enhance the WEC modes of operation. How these facilities will be used to make scientific measurements is described. ESA

N93-31709# Sheffield Univ. (England).
AN INVESTIGATION OF DAYSIDE FTE'S OBSERVED BY THE AMPTE-UKS SATELLITE
A. P. Ameen, H. S. C. Alleyne, S. N. Walker (European Space Agency. ESRIN, Frascati, Italy.), and L. J. C. Woolliscroft *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 249-254 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A survey of all Flux Transfer Events (FTEs) which were observed both exterior and interior to the dayside magnetopause by the AMPTE-UKS (Active Magnetosphere Tracer Explorer United Kingdom Satellite) during its five months of operation (Aug. 1984 to Jan. 1985) is presented. This survey considers these events from a statistical approach and this complements previous detailed studies of particular events. It extends previous statistical surveys by including consideration of the plasma wave data. The survey is based on the Saunders and Rijnbeek catalog for the UKS FTEs which include 74 events detected on 24 orbits using the Rinjbeek et al. 1984 criteria to identify the FTEs. In local time these FTEs extend from mid-afternoon to the nightside of the dawn meridian. It was found that the probability of occurrence of FTEs at low latitude is higher than at a slightly higher latitude. Some 80% of the recurrence of FTEs within the same orbit were detected within 20 min. The typical duration of the FTEs is found to be about 2 min; however, this value can vary from a few tens of sec up to 5 or 6 min (although the lower limit is related to the selection criteria). The waves associated with FTEs were also investigated using data from the UKS stepped frequency analyzer for the frequency range 0.5 to 132 kHz and the UKS autocorrelator which covers the frequency range 0.11 to 3.9 kHz. Most of the 37 events detected in the boundary layer did show a clear enhancement in wave power while very few of the 23 magnetosheath events have shown an enhancement in wave activity. However, in none of the FTEs surveyed does the amplitude of all waves exceed one millivolt per meter, such amplitude is too small for these waves to have a primary role in the processes of dissipation and reconnection. Substantial wave power might be carried by lower frequency waves, for example at ion gyrofrequency or lower hybrid frequency, which were not explored by the UKS wave experiment. The wave data show that the strongest waves were observed near local noon. ESA

N93-31710# Southwest Research Inst., San Antonio, TX.
AURORAL CLUSTER: SCIENCE OBJECTIVES AND MEASUREMENT STRATEGIES
J. L. Burch, J. P. Andrews (Colorado Univ., Boulder.), J. R. Scherrer, and J. H. Waite, Jr. *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 255-262 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The scientific objectives, the Strawman science payload, and the command and data handling operations of Auroral Cluster, a space physics mission that has been identified by the NASA Space Physics Strategic Implementation Study as a candidate for flight in the next decade, are addressed together with details of the spacecraft and its orbit. The Strawman payload consists of a set of sensors that will measure electric and magnetic fields, plasmas, and auroral particles. As presently conceived, the year long mission will employ a cluster of four 'electronically tethered' spacecraft outfitted with similar complements of scientific instruments to make simultaneous multipoint plasma measurements in the Earth's auroral regions. The strategy of correlative, multipoint measurements in situ will make it possible for the first time to resolve spatially and temporally varying plasma phenomena that play a key role in the coupling of the magnetosphere and the ionosphere. ESA

N93-31711# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
MIRROR MODE AND OTHER COMPRESSIVE ULF MODES **c32**
G. Belmont, D. Hubert (Observatoire de Paris-Meudon, France.), C. Lacombe (Observatoire de Paris-Meudon, France.), and F. Pantellini (Observatoire de Paris-Meudon, France.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 263-267 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A new kinetic method, close to fluid ones, is used to solve analytically the problem of ULF modes. For the first time, two solutions are clearly shown to exist simultaneously, even in an isotropic plasma, with the same M(parallel) polarization: they are called 'mirror mode' and 'slow mode' respectively, because the first one gives rise to the mirror instability when a sufficient anisotropy is included, and the second one gives rise to the usual slow mode when looking to the well documented low beta case. The used analytical procedure allows the two modes to be made to appear as the two solutions of the same quadratic dispersion equation. In contrast, the magnetohydrodynamic calculations are known to provide only one solution (called slow mode for small anisotropies and mirror instability for large perpendicular anisotropy); on the other hand, the usual analytical kinetic calculations do provide a correct treatment for all modes, but they generally need to remain tractable. Furthermore, the comparison between the kinetic results and the simple fluid ones appears much more straightforward with the method proposed than it does usually. The theoretical study allowed identification as mirror modes of the ULF waves observed downstream of the terrestrial bow shock in quasi-perpendicular conditions. ESA

N93-31712# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
VIKING OBSERVATIONS OF ELECTRIC FIELDS
L. G. Blomberg, P.-A. Lindqvist, and G. T. Marklund *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 269-274 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Viking measurements at high dayside latitudes of electric and magnetic fields are used to study large scale convection and its relation to regions of highly fluctuating fields, characteristic of the oval, and regions of high plasma density, typically associated with the cusp. The plasma density is inferred from the satellite potential which is a very useful parameter monitored by the electric field instrument. Data from more than 600 Viking orbits are used, binned according to different geophysical and interplanetary 'activity parameters', in particular different interplanetary magnetic field orientations.

A subset of the data is used for exemplifying correlations between the electric and the magnetic fields, which have different interpretations depending on their phase relation. ESA

N93-31713# Rutherford High Energy Lab., Chilton (England). Space Science Dept.

CO-ORDINATED DATA HANDLING FOR THE UK PARTICIPANTS IN THE CLUSTER MISSION **c82**

A. M. Cruise, L. J. Woolliscroft (Sheffield Univ., England.), E. Dunford, S. J. Schwartz (London Univ., England.), P. A. Vaughan, and E. Golton *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 275-277 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The UK space science community's commitment to the SOHO/Cluster combined mission, of hardware contributions to four of the Cluster instruments and two of the SOHO instruments, is addressed, together with the development and architecture of the related coordinated data handling facility. The scientific benefits of coordinating the data analysis between the various instruments and scientific institutes was a major factor in demonstrating the potential of the Cluster mission to UK funding agencies and approval has already been obtained for a Cluster Data Center and the study of a Cluster Science Center. Details of the data flow through such facilities are presented, together with a summary of the scientific benefits to be obtained from the wide range of instruments on Cluster. ESA

N93-31714# Swedish Inst. of Space Physics, Uppsala.

PLASMA WAVES INTERFEROMETRY ON CLUSTER **c75**

G. Gustafsson and K. Stasiewicz *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 279-282 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Data from a single spacecraft wave interferometer on Viking is used to illustrate the potential capabilities of the Electric Field Wave (EFW) experiment on Cluster. The EFW experiment for Cluster consists of four probes mounted on 50 m long booms. The instrument is capable of measuring density and/or electric field waveforms with up to 9000 samples/s per probe in many different operation modes. One useful combination is to measure density fluctuations on two probes and to use the other two probes for electric field measurements. By measuring the time difference of a wave front arrival at two probes, the velocity of plasma structures can be determined. The high sampling frequency will make it possible to resolve the plasma fronts/wave velocities of up to 900 km/s by a single spacecraft interferometer. Multispacecraft interferometry with base lengths of 300 to 6000 km will increase significantly the capabilities of the instrument and will make it possible to measure group velocities of fast magnetosonic/Alfven waves, to resolve the wave propagation directions and to determine the spatial extent of plasma structures. ESA

N93-31715# Rutherford High Energy Lab., Chilton (England).

DISTRIBUTED DATA SYSTEMS IN SPACE PHYSICS

M. A. Hapgood, S. N. Walker (European Space Agency. ESRIN, Frascati, Italy.), and L. J. C. Woolliscroft (Sheffield Univ., England.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 283-288 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The handling of data from future multispacecraft space physics missions, such as Cluster, is addressed. It is considered that the whole Inter Agency Consultative Group (IACG) initiative will be a success only if data systems can be constructed which allow the scientific community to make effective use of the data. As a result there is considerable interest in the use of distributed data systems to handle space physics data in Europe. In particular, the challenge of handling data from the four spacecraft Cluster mission has lead to the adoption of a distributed approach for the Cluster Science Data System. The design of such systems requires a careful analysis of both user requirements and technical limitations so that the best balance can be found. Some key requirements are discussed and their implications in a distributed environment are explored. ESA

N93-31716# Rutherford High Energy Lab., Chilton (England).

CORONAL MASS EJECTA AND FLARES: A STATISTICAL STUDY **c92**

R. A. Harrison and D. G. Sime (National Center for Atmospheric Research, Boulder, CO.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 289-293 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

An attempt to identify purely formal correlations between parameters relating to flare and mass ejection observations during the period 1986 to 1987 is reported. A typical solar Coronal Mass Ejection (CME) occurs on a very large spatial scale (typical width 45 deg) and involves the expulsion of up to 10 to the 12th power kg, and the release of up to 10 to the 25th power J from the coronal magnetic field. A solar flare is an explosive event at the base of the atmosphere involving the release of up to 10 to the 25th power J of energy. Several large datasets were compared using the CME event lists from the Solar Maximum Mission coronagraph. Flare activity of the same period was examined using the GOES 1 to 8 A soft x-ray profiles. These are full Sun and thus, suffer from event superposition. Unlike previous studies, flares were identififed by changes in the x-ray profile rather than threshold crossings, and the background intensity is subtracted when the flare intensity is reported. The H alpha flare listings were used to identify the locations of the x-ray flare activity. In spite of a strong association between flares and CME onsets, no single type of flare shows preferred association with mass ejections and the relative locations and timing of the two phenomena show no systematic ordering. ESA

N93-31717# Academy of Sciences (USSR), Moscow. Space Research Inst.

ROLE OF THE INTERBALL SMALL SCALE INVESTIGATIONS IN THE GGS PROGRAM

S. Klimov, S. Savin, M. Nozdrachev, N. Nikolaeva, M. Mogilevsky, A. Petrukovich, S. Romanov, A. Skalsky, J. Blecki (Polish Academy of Sciences, Warsaw.), and J. Juchniewicz (Polish Academy of Sciences, Warsaw.) et al *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 295-299 Prepared in cooperation with Max-Planck-Inst. fuer Extraterrestrische Physik, Berlin, Germany; DRL, Berlin, Germany; CNR, Frascati, Italy; Sheffield Univ., England; Academy of Sciences of the Ukraine, Lvov; and Ceskoslovenska Akademie Ved, Prague (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The strategy of satellites and subsatellites separation in the INTERBALL project, which will study the majority of regions responsible for dynamics of the entire magnetosphere-ionosphere system, is discussed. The distribution of the satellites involved, that is the TAIL and AURORAL probes and their subsatellites, is based on both the scientific goals and the minimum fuel consumption request. Their distribution within the frame of the Global Geospace Science program, which will study the Earth's magnetosphere with a multisatellite system, is discussed. Small scale phenomena, with a length of 1 to 1000 km, providing plasma mass and energy transports, are outlined, particularly for the magnetopause, auroral zone, plasma sheet boundary layer, and bow shock. The capabilities of the TAIL probe provide the unique opportunity to investigate phenomena with spatial scales less than 10 km. The separation of TAIL probe subsystem should be of the order of a few thousand km to allow the global correlative studies of the Earth's magnetosphere. The distance of the AURORAL probe subsystem should be altered from a few km to a few hundred km in order to provide correlative studies of the processes in the auroral region and in the outer magnetosphere. ESA

N93-31718# Main Astronomical Observatory, Kiev (Ukraine).

ON THE BERNSTEIN MODES GENERATION IN SOLAR POST-FLARE LOOPS **c92**

A. N. Kryshtal *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 301-306 (For primary document see N93-31674 12-90)

Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Large scale electric field in the solar coronal post flare loops can give rise to the electron Bernstein mode instability development in hot magnetoactive plasma. The case of long wavelength perturbations is studied, when Landau damping is substantially less than collision one. It is shown, in stationary scenario, when electrons do not pass into the 'runway' regime, instability development and Bernstein mode generation are possible at the

frequency of second harmonic. For the second harmonic and the field values E(sup B)(sub 0) (initial for the beginning of instability), close to the value E(sup theta)(sub cr) of critical Dreiser field, the time of instability development appears to be approximately 0.001 to 0.03 sec. ESA

N93-31719# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
INVESTIGATION OF FINE-SCALE AURORA WITH THE FREJA ELECTRIC FIELD INSTRUMENT
G. T. Marklund, Lars G. Blomberg, and P.-A. Lindqvist *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 307-313 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A description of the Freja double probe electric field instrument and its capabilities to perform detailed high resolution measurements of the aurora and the auroral fine structure in the dynamic transition region between the upper ionosphere and the innermost magnetosphere is given. The in situ electric field measurements, supplemented by magnetic field and particle observations, will provide fundamental information not only on the acceleration mechanisms itself, but also on the formation, energy transfer, and current closure mechanisms of the different auroral structures. The highly structured and intense electric fields observed by Viking on auroral flux tubes at high altitudes (and occasionally by rockets down to the uppermost ionosphere) include low frequency electric field fluctuations (causing a selective acceleration of ions and electrons), weak double layers, and shock-like electric fields at various scale sizes ranging down to the minimum scale size of auroral arcs (less than 100 m). The Freja electric field instrument developed to investigate these small scale phenomena is a highly flexible instrument with a number of different operational modes. It is also equipped with a 4 Megabyte burst memory for high data sampling rate (6144 samples/s) and for temporary data storage. ESA

N93-31720# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (Germany).
SPECTRA AND STRUCTURE FUNCTIONS OF TEMPERATURE FLUCTUATIONS IN THE INNER SOLAR WIND **c92**
Eckart Marsch, S. Liu, C.-Y. Tu (Beijing Univ., China.), and H. Rosenbauer *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 315-320 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Proton temperature measurements from the Helios mission were analyzed in order to derive spectral and scaling characteristics of temperature fluctuations in the inner heliosphere near 0.3 AU. Special attention is paid to their correlation with the large scale stream structure. Different scaling properties of the fluctuations are obtained in fast and slow wind. The temperature spectra seem to indicate fully developed Gaussian turbulence. However, the pth order structure functions of the temperature fluctuations considerably deviate from Kolmogorov scaling. They indicate intermittency and variable scaling behavior of the temperature differences as a function of the time lag between subsequent measurements. The nature and possible origin of the temperature fluctuations in the solar wind are discussed. ESA

N93-31721# Alcala de Henares Univ., Madrid (Spain). Dept. de Fisica.
CALIBRATION OF A DETECTOR SYSTEM FOR SOLAR ENERGETIC PARTICLES ANALYSIS **c92**
Jose Medina, L. delPeral, S. Sanchez, and D. Meziat *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 321-325 (For primary document see N93-31674 12-90)
(Grant CICYT-ESP88-0306-C02-02)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The heavy ions calibration of a detector telescope is presented. The telescope is able to study solar energetic particles from helium to iron up to an energy of 50 MeV/nucleon. The telescope consists of four silicon surfer barrier circular detectors with a 40 degree aperture angle. The calibration was performed in the VICKS (German acronym for Van der Graaf isochron cyclotron combination for heavy ions) accelerator with a 795 MeV ion beam. The raw data, charge and mass spectra are presented, concluding a suitable resolution in charge and mass for registered fragments. ESA

N93-31722# Oulu Univ. (Finland). Dept. of Physics.
IONOSPHERIC CONTROL OF THE LONG-TERM OCCURRENCE OF Pc1 PULSATIONS OBSERVED ON GROUND
K. Mursula, T. Rinne, J. Kangas, and T. Pikkarainen *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 327-331 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The approximate inverse correlation between the annual sunspot number and the annual amount of Pc1 pulsations observed on ground was recently verified using very long series of high and midlatitude observations extending over several complete solar cycles. The solar cycle behavior of the average frequency of Pc1 pulsations at high latitudes was studied, classifying the events into structured and unstructured Pc1's. It was found that the average frequency of structured Pc1's decreases with solar activity, but that of unstructured increases. These results support the idea that changes in the propagation conditions of the ionospheric wave guide over the solar cycle are the main factor responsible for the long term occurrence rate of Pc1 pulsations detected by ground based observers. ESA

N93-31723*# Alabama Univ., Huntsville. Center for Space Plasma and Aeronomic Research.
THREE-DIMENSIONAL NUMERICAL SIMULATION OF INTERPLANETARY MAGNETIC FIELD CHANGES AT 1 AU AS A CONSEQUENCE OF SIMULATED SOLAR FLARES **c92**
S. T. Wu, Chin-Chun Wu, and Murray Dryer (National Oceanic and Atmospheric Administration, Boulder, CO.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 333-336 (For primary document see N93-31674 12-90)
(Contract NAGw-9; NOAA-50RANR000104)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

In order to study the relationship between different forms of activity and transient variations of the north-south component, B(sub z), of the Interplanetary Magnetic Field (IMF), at 1 AU, a three dimensional numerical simulation code was employed to study several aspects of this problem. One form of solar activity, the flare, is simulated by using a pressure pulse at different locations near the solar surface and observing the simulated IMF evolution of B(sub theta)(-B(sub z)) at 1 AU. It was found, for a given pressure pulse, that the orientation of the corresponding transient variation of B(sub z) has a strong relationship with the location of the pressure pulse and the initial condition of IMF. ESA

N93-31724# Main Astronomical Observatory, Kiev (Ukraine).
NONLINEAR INTERACTION OF ALFVEN WAVES IN SOLAR ATMOSPHERE **c92**
A. K. Yukhimuk, N. Y. Kotsarenko (Kiev State Univ., USSR.), and V. A. Yukhimuk (Kiev State Univ., USSR.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 337-341 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Nonlinear interaction of an Alfven wave with high frequency waves is considered. The coupling of waves is realized due to the ponderomotive force, the origin of which is a result of wave interaction. The presence of coupling of waves result in wave energy transfer from the high frequency mode to the low frequency one. Above mentioned nonlinear processes can occur in solar atmosphere and solar wind transition region during the solar flares. ESA

N93-31725*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CELIAS: CHARGE, ELEMENT AND ISOTOPE ANALYSIS SYSTEM FOR THE SOHO MISSION **c92**
D. Hovestadt (Max-Planck-Inst. fuer Physik und Astrophysik, Garching, Germany.), J. Geiss (Bern Univ., Switzerland.), G. Gloeckler (Maryland Univ., College Park.), W. I. Axford (Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau, Germany.), H. Balsinger (Bern Univ., Switzerland.), P. Bochsler (Bern Univ., Switzerland.), A. Buergi (Max-Planck-Inst. fuer Physik und Astrophysik, Garching, Germany.), R. Canfield (National Inst. of

Standards and Technology, Gaithersburg, MD.), M. Coplan (Maryland Univ., College Park.), and H. Dinse (Technische Univ., Brunswick, Germany.) et al *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 343 Prepared in cooperation with Arizona Univ., Tucso n, New Hampshire Univ., Durham, Academy of Sciences (USSR), Moscow, Univ. of Southern California, Los Angeles, Physikalisch-Technische Bundesanstalt, Berlin, Germany, and NIST, Gaithersburg, MD (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The status and further development as well as first calibration of the CELIAS experiment on SOHO is presented. CELIAS is designed to measure the mass, ionic charge, and energy of low and high speed solar wind of suprathermal ions and of low energy flare particles. Through analysis of the elemental and isotopic abundances (the ionic charge state and velocity distributions of ions originating on the solar atmosphere), the investigation focuses on studying the plasma processes in various temporal and spatial scales in the solar chromosphere, transition zone, and corona. Additionally, the CELIAS experiment includes the Solar EUV Monitor (SEM). This unit, which consists of an EUV transmission grating spectrometer and three isolated silicon photodiodes as detectors, is described. The three mass and charge discriminating sensors based on the time of flight technique are also described. ESA

N93-31726# Ben Gurion Univ. of the Negev, Beersheva (Israel). Dept. of Physics.
POSSIBLE MANIFESTATION OF THE CRITICAL IONIZATION VELOCITY PHENOMENON IN THE SOLAR CORONA c92
E. I. Golbraikh and M. A. Filippov *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 345-350 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

An approach to the problem of the origin of varieties of the very important phenomena of solar corona, such as Coronal Mass Ejections (CME) and flares, was developed. In terms of the approach, the possible role of the critical ionization mechanism for solar atmosphere was examined. This mechanism, called the 'Critical Ionization Velocity (CIV) phenomenon', was investigated earlier in the laboratory both by full scale experiments as well as theoretically. The findings show the significant role of CIV phenomenon in initiation of CMEs and flares. ESA

N93-31737*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
SPECTRAL CLASSIFICATION WITH THE INTERNATIONAL ULTRAVIOLET EXPLORER: AN ATLAS OF B-TYPE SPECTRA
Janet Rountree and George Sonneborn Aug. 1993 62 p
(RTOP 680-00-00)
(NASA-RP-1312; NAS 1.61:1312; Rept-93B00096) Avail: CASI HC A04

New criteria for the spectral classification of B stars in the ultraviolet show that photospheric absorption lines in the 1200-1900A wavelength region can be used to classify the spectra of B-type dwarfs, subgiants, and giants on a 2-D system consistent with the optical MK system. This atlas illustrates a large number of such spectra at the scale used for classification. These spectra provide a dense matrix of standard stars, and also show the effects of rapid stellar rotation and stellar winds on the spectra and their classification. The observational material consists of high-dispersion spectra from the International Ultraviolet Explorer archives, resampled to a resolution of 0.25 A, uniformly normalized, and plotted at 10 A/cm. The atlas should be useful for the classification of other IUE high-dispersion spectra, especially for stars that have not been observed in the optical. Derived from text

N93-31837*# Fermi National Accelerator Lab., Batavia, IL.
CONSTRAINTS ON COSMIC STRINGS DUE TO BLACK HOLES FORMED FROM COLLAPSED COSMIC STRING LOOPS
R. R. Caldwell and Evalyn Gates (Chicago Univ., IL.) May 1993 12 p
(Grant NAGw-2381)
(NASA-CR-193248; NAS 1.26:193248; FERMILAB-Pub-93/137-A) Avail: CASI HC A03/MF A01

The cosmological features of primordial black holes formed from collapsed cosmic string loops are studied. Observational restrictions on a population of primordial black holes are used to restrict f, the fraction of cosmic string loops which collapse to form black holes, and mu, the cosmic string mass-per-unit length. Using a realistic model of cosmic strings, we find the strongest restriction on the parameters f and mu is due to the energy density in 100MeV photons radiated by the black holes. We also find that inert black hole remnants cannot serve as the dark matter. If earlier, crude estimates of f are reliable, our results severely restrict mu, and therefore limit the viability of the cosmic string large-scale structure scenario. Author (revised)

N93-32415# National Museum of Natural History, Washington, DC.
FIELD AND LABORATORY INVESTIGATIONS OF ANTARCTIC METEORITES COLLECTED BY UNITED STATES EXPEDITIONS, 1985-1987
U. B. Marvin and G. J. MacPherson 1992 124 p
(PB93-182723) Avail: CASI HC A06/MF A02

The monograph describes the meteorite collecting activities of the United States Antarctic Search for Meteorites (ANSMET) expeditions during the 1984-1985, 1985-1986, and 1986-1987 field seasons. Descriptions and classifications are given of most specimens collected during those expeditions with the exceptions of the types 4, 5, and 6 ordinary chondrites, whose properties are tabulated. Two articles are included that summarize data on the terrestrial ages and thermoluminescence properties of Antarctic meteorites. The Appendix lists all ANSMET specimens classified as of June 1987, in numerical order for each locality and by meteorite class. NTIS

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance.*

N93-31933*# Lunar and Planetary Inst., Houston, TX.
MSATT WORKSHOP ON CHEMICAL WEATHERING ON MARS Abstracts only
Roger Burns, ed. (Massachusetts Inst. of Tech., Cambridge.) and Amos Banin, ed. (National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.) 12 Sep. 1992 49 p Workshop held in Cocoa Beach, FL, 10-12 Sep. 1992
(Contract NASw-4574)
(NASA-CR-193209; NAS 1.26:193209; LPI/TR-92-04-Pt-1) Avail: CASI HC A03/MF A01

The topics covered with respect to chemical weathering on Mars include the following: Mars soil, mineralogy, spectroscopic analysis, clays, silicates, oxidation, iron oxides, water, chemical reactions, geochemistry, minerals, Mars atmosphere, atmospheric chemistry, salts, planetary evolution, volcanology, Mars volcanoes, regolith, surface reactions, Mars soil analogs, carbonates, meteorites, and reactivity. For individual titles, see N93-31934 through N93-31963.

N93-31934*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
THE MINERALOGY AND FORMATION PROCESSES OF MARS SOIL Abstract only
Amos Banin (Hebrew Univ. of Jerusalem, Rehovot, Israel.) *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 1-2 (For primary document see N93-31933 12-91)
Avail: CASI HC A01/MF A01

The mineralogical nature of Mars soil is far from being understood, nor are the formation time and weathering processes known. Quantitatively, the two major mineral-forming elements in Mars soil are silicon and iron, constituting 44 and 19 percent of the soils as SiO4 and Fe2O3, respectively. The silicate phases have been studied only briefly, mostly because of their limited spectral fingerprinting in the VIS and NIR. Much attention was given to the iron minerals in the soil, due to their pronounced absorption in the VIS and NIR, making them easily detectable by telescopic observations. The available information on Mars soil mineralogy, mostly obtained by remote sensing, is reviewed, and it is hypothesized that it leads to the suggestion that nanophase short-range-order (amorphous) phases of the silicates and iron oxides abound in the soil.
Derived from text

N93-31935*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

MARTIAN WEATHERING/ALTERATION SCENARIOS FROM SPECTRAL STUDIES OF FERRIC AND FERROUS MINERALS Abstract only

James F. Bell, III, John B. Adams (Washington Univ., Seattle.), and Richard V. Morris (National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.) *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 2-4 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

We review the major aspects of our current knowledge of martian ferric and ferrous mineralogy based on the available ground-based telescopic and spacecraft data. What we know and what we don't know are used to constrain various weathering/alteration models and to identify key future measurements and techniques that can distinguish between these models. Author (revised)

N93-31936*# Brown Univ., Providence, RI. Dept. of Geological Sciences.

EFFECTS OF THE CHEMICAL ENVIRONMENT ON THE SPECTROSCOPIC PROPERTIES OF CLAYS: APPLICATIONS FOR MARS Abstract only

Janice L. Bishop and Carle M. Pieters *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 4-6 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

Laboratory studies of Mars soil analogs pose unique problems, since soils interact readily with their environment and exhibit variable characteristics depending on the environment. We have performed a series of experiments focusing on the spectral properties of clays and how they vary as a function of composition and environment, including examination of fundamental as well as overtone absorptions, that occur in the mid- and near-IR, respectively. Smectite clays have been selected in our laboratory experiments as a primary surface analog for Mars because of their compatibility with results of the Viking biology experiments, their stability under current martian conditions, and their compatibility with reflectance spectra of Mars. We prepared a number of monoionic montmorillonites in order to examine the influence of cations on the water molecules in the clay interlayer region. Moessbauer spectra of several montmorillonites with variable amounts of interlayer iron confirm the presence of ferrihydrite. Derived from text

N93-31937*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth, Atmospheric, and Planetary Sciences.

DEHYDROXYLATED CLAY SILICATES ON MARS: RIDDLES ABOUT THE MARTIAN REGOLITH SOLVED WITH FERRIAN SAPONITES Abstract only

Roger G. Burns *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 6-7 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

Clay silicates, resulting from the chemical weathering of volcanic glasses and basaltic rocks of Mars, are generally believed to be major constituents of the martian regolith and atmospheric dust. Because little attention has been given to the role, if any, of Mg-bearing clay silicates on the martian surface, the crystal chemistry, stability, and reactivity of Mg-Fe smectites are examined. Partially dehydroxylated ferrian saponites are suggested to be major constituents of the surface of Mars, regulating several properties of the regolith. Derived from text

N93-31938*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth, Atmospheric, and Planetary Sciences.

THE FATE OF IRON ON MARS: MECHANISM OF OXIDATION OF BASALTIC MINERALS TO FERRIC-BEARING ASSEMBLAGES Abstract only

Roger G. Burns *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 8-9 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

Perhaps the most conspicuous indication that chemical weathering has occurred on the surface of Mars is the overall color of the red planet and the spectroscopic features that identify ferric-bearing assemblages in the martian regolith. Apparently, Fe(2+) ions in primary minerals in parent igneous rocks on the martian surface have been oxidized to ferric iron, which occurs in degradation products that now constitute the regolith. The mineralogy of the unweathered igneous rocks prior to weathering on the martian surface is reasonably well constrained, mainly as a result of petrographic studies of the SNC meteorites. However, the alteration products resulting from oxidative weathering of these rocks are less well-constrained. The topics covered include the following: primary rocks subjected to chemical weathering; dissolution processes; oxidation of dissolved Fe(2+); mechanism of polymerization of hydrous ferric oxides; terrestrial occurrences of ferromagnesian smectites; and dehydroxylated Mg-Fe smectites on Mars. Derived from text

N93-31939*# Martin Marietta Corp., Denver, CO. Planetary Sciences Lab.

IMPLICATIONS FOR VOLCANOGENIC VOLATILE RELEASE ON THE WEATHERING OF MARS Abstract only

Benton C. Clark *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 9-10 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

Volcanism on Mars has been widespread in both space and time. Notwithstanding important specific differences between the mantles of Earth and Mars, the similarities are such that the suite of gases emitted from martian volcanic activity surely includes gases such as H2O, CO2, S-containing gases (H2S, SO3, or SO2), and Cl-containing gases (e.g. Cl or HCl). Both H2O and CO2 are present in the atmosphere of Mars; both are also present as surface condensates. Spectroscopic observations of the martian atmosphere clearly show that the S- and Cl-containing gases are severely depleted. Likewise, there is no evidence of surface condensates of compounds of these elements. Within the soil, there is direct evidence of incorporation of H2O and some compounds of sulfur and chlorine. None of the resultant weathering products have been directly identified, but both clays and salts have been indirectly implicated. Other aspects of the implications for volcanogenic volatile release on the weathering of Mars are discussed. Derived from text

N93-31940*# Oregon Univ., Eugene. Dept. of Geological Sciences.

CALCULATED MINERAL PRECIPITATION UPON EVAPORATION OF A MODEL MARTIAN GROUNDWATER NEAR 0 C Abstract only

J. D. DeBraal, M. H. Reed, and G. S. Plumlee (Geological Survey, Denver, CO.) *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 10-11 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

Previously, the effect of weathering a basalt of Shergotty meteorite composition with pure water buffered at martian atmospheric values of CO2 and O2, to place constraints upon the composition of martian groundwater, and to determine possible equilibrium mineral assemblages was calculated. A revised calculation of the composition of the aqueous phase in the weathering reaction as a function of the amount of basalt titrated into the solution is shown. The concentrations of sulfate and chloride ions increase in the solution from high water/rock ratios (w/r) on the left to low water/rock ratios on the right, until at w/r = 1, where 1 kg of basalt has been titrated, sulfate concentration is 1564 ppm and chloride is 104 ppm. This resulting fluid is dominated by sulfate and sodium, with bicarbonate and chloride at about the same concentration. This solution was evaporated in an attempt to determine if the resulting evaporite can explain the Viking XRF data. The program CHILLER was used to evaporate this solution at 0.1 C. Author (revised)

N93-31941*# Max-Planck-Inst. fuer Chemie, Mainz (Germany).

ON THE WEATHERING OF MARTIAN IGNEOUS ROCKS Abstract only

G. Dreibus and H. Waenke *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 11-12 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

Besides the young crystallization age, one of the first arguments for the martian origin of shergottite, nakhlite, and chassignite (SNC) meteorites came from the chemical similarity of the meteorite Shergotty and the martian soil as measured by Viking XRF analyses. In the meantime, the discovery of trapped rare gas and nitrogen components with element and

isotope ratios closely matching the highly characteristic ratios of the Mars atmosphere in the shock glasses of shergottite EETA79001 was further striking evidence that the SNC's are martian surface rocks. The martian soil composition as derived from the Viking mission, with its extremely high S and Cl concentrations, was interpreted as weathering products of mafic igneous rocks. The low SiO2 content and the low abundance of K and other trace elements in the martian soils point to a mafic crust with a considerably smaller degree of fractionation compared to the terrestrial crust. However, the chemical evolution of the martian regolith and soil in respect to surface reaction with the planetary atmosphere or hydrosphere is poorly understood. A critical point in this respect is that the geochemical evidence as derived from the SNC meteorites suggests that Mars is a very dry planet that should have lost almost all its initially large water inventory during its accretion. Author (revised)

N93-31942*# Arizona Univ., Tucson. Planetary Image Research Lab.
AN UNUSUAL SPECTRAL UNIT IN WEST CANDOR CHASMA: EVIDENCE FOR HYDROTHERMAL OR AQUEOUS ALTERATION? Abstract only
P. E. Geissler and R. B. Singer *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 12-14 (For primary document see N93-31933 12-91)
Avail: CASI HC A01/MF A01

A spectrally distinctive unit on the floor of W. Candor Chasma (6 S, 76 W) in the central Valles Marineris may be a likely candidate for hydrothermal or aqueous alteration. This unusual material is noticeably redder than nearby plains and canyon floor-covering deposits of similar brightness in several Viking Orbiter color composite images calibrated using PICS Level I procedures. The surrounding plains and canyon floor units have colors that are typical for much of the weathered soil on Mars. Relative to adjacent materials, the West Candor unit has lower green-filter reflectance and higher red-filter reflectance. While subtle, these spectral characteristics were observed for this unit in a number of multi-spectral images acquired at different seasons and phase angles. When the color image data are transformed to hue, saturation, and value coordinates, the West Candor material stands out prominently among the rocks and soils of Coprates Quadrangle as a spatially coherent unit with a unique hue. Physically, this means that the unit is compositionally distinct (unlike most of the bright materials in the region), since its spectral reflectance cannot be obtained through simple multiplicative scaling of the reflectance of the surrounding bright materials or by altering the spectral reflectance of the surrounding materials with an additive constant that is independent of wavelength. Recent studies of the directional reflectance properties of the surface in this region indicate that the photometric phase function of the unit is similar to that of surrounding bright materials (isotropic to slightly back scattering). Author (revised)

N93-31943*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
LOCATION OF NANOPHASE Fe-OXIDES IN PALAGONITIC SOILS: IMPLICATION FOR MARTIAN PIGMENTS Abstract only
D. C. Golden, R. V. Morris, D. W. Ming, and H. V. Lauer, Jr. (Lockheed Engineering and Sciences Co., Houston, TX.) *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 14-16 (For primary document see N93-31933 12-91)
Avail: CASI HC A01/MF A01

Palagonitic materials from Mauna Kea, Hawaii, were identified as Mars analogs based on their spectral and magnetic properties. These materials probably resulted from hydrothermal alteration during eruption of the volcano and/or from weathering under ambient conditions. The reflectance spectra of the Mars surface obtained by Earth-based telescopes and the reflectance spectra of analogs obtained in the laboratory show features due to electronic transitions of Fe(III) in oxide particles that range in size from nanometer (nanophase) to micrometer sized or larger. The presence of Fe(III) suggests oxidizing conditions during the alteration process in Mars that may have occurred in the past or during a slow ongoing process. Two naturally altered basaltic samples from Hawaii (HWMK12 and HWMK13) and a laboratory-altered (PH-13-DCGT2) basaltic glass similar in elemental composition to the above two samples was examined. All three samples exhibited spectral characteristics similar to martian bright-region spectra. Chemical and mineralogical changes occurring at the surface of these basalts were studied in order to understand the basis for their Mars-like properties. The spectral properties of the three samples were examined after the removal of Fe oxides by chemical extractants. Author (revised)

N93-31944*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
AQUEOUS GEOCHEMISTRY ON MARS: POSSIBLE CLUES FROM SALTS AND CLAYS IN SNC METEORITES Abstract only
James L. Gooding *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 16-17 (For primary document see N93-31933 12-91)
Avail: CASI HC A01/MF A01

All subgroups of the shergottite, nakhlite, and chassignite (SNC) meteorites contain traces of water precipitated minerals that include various combinations of carbonates, sulfates, halides, ferric oxides, and aluminosilicate clays of preterrestrial origin. Oxygen three-isotope analysis of thermally extracted bulk water has confirmed that at least some of the water in SNC's is, indeed, extraterrestrial. A mixture of aqueous precipitates found in the SNC's, comprising smectite, illite, and gypsum (with minor halite +/- calcite and hematite), provides a self-consistent, though not unique, model for the bulk elemental composition of surface sediments at the Viking Lander sites. Therefore, if the salts and clays in SNC's are truly linked to aqueous alteration and soil formation on Mars, then the suite of SNC secondary minerals might provide the best currently available insight into near-surface martian chemistry. Author (revised)

N93-31945*# Arkansas Coll., Batesville. Dept. of Chemistry.
EFFECT OF PURITY ON ADSORPTION CAPACITIES OF A MARS-LIKE CLAY MINERAL AT DIFFERENT PRESSURES Abstract only
Traci Jenkins, Bridgett McDoniel, Roberta Bustin, and Judith H. Allton (Lockheed Engineering and Sciences Co., Houston, TX.) *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 17-18 (For primary document see N93-31933 12-91)
Avail: CASI HC A01/MF A01

There has been considerable interest in adsorption of carbon dioxide on Marslike clay minerals. Some estimates of the carbon dioxide reservoir capacity of the martian regolith were calculated from the amount of carbon dioxide adsorbed on the ironrich smectite nontronite under martian conditions. The adsorption capacity of pure nontronite could place upper limits on the regolith carbon dioxide reservoir, both at present martian atmospheric pressure and at the postulated higher pressures required to permit liquid water on the surface. Adsorption of carbon dioxide on a Clay Mineral Society standard containing nontronite was studied over a wide range of pressures in the absence of water. Similar experiments were conducted on the pure nontronite extracted from the natural sample. Heating curves were obtained to help characterize and determine the purity of the clay sample. Author (revised)

N93-31946*# Technical Univ. of Denmark, Lyngby. Applied Physics Lab.
LOW-TEMPERATURE FORMATION OF MAGNETIC IRON OXIDES Abstract Only
Chr. Bender Koch and M. B. Madsen (Orsted Inst., Copenhagen, Denmark.) *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 18-19 (For primary document see N93-31933 12-91)
Avail: CASI HC A01/MF A01

Elemental analysis and magnetic measurements of the surface of Mars have indicated the presence of an iron oxide with a considerable magnetic moment. Identification of the oxide phase(s) is an important subject as this may be used to identify the process of weathering on the martian surface as well as the composition of the Mars regolith itself. Consequently, interest was in evidence of new formation of strongly magnetic phases (e.g., magnetite, maghemite, feroxyhyte) in terrestrially derived Mars sample analogs. Within the group of Mars sample analogs derived from low-temperature weathering of basalts in Arctic regions, evidence of magnetic oxides formed at the outermost weathering rind was never observed. However, in one instance where the weathering products accumulating in a crack of a basaltic stone were investigated, evidence of magnetite was found. The experimental details are presented. Author (revised)

N93-31947*# Scripps Institution of Oceanography, La Jolla, CA. Geological Research Div.

IMPLICATIONS OF ISOTOPIC COMPOSITIONS OF N AND Ne IN THE MARTIAN ATMOSPHERE TO TEMPORAL EVOLUTION OF ITS ATMOSPHERE AND REGOLITH Abstract only

D. Lal *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 19 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

The isotopic compositions of N and Ne in the Martian atmosphere are governed by several factors, principal among which are the temporal evolution in (1) the absolute surface pressure of oxygen, (2) the physicochemical characteristics of the regolith, and finally (3) the N-15 enrichment expected due to preferential hydrodynamical escape of N-14 (due to solar wind bombardment). Each of these factors is unique to Mars. In fact, no other planet offers the uniquely favorable situations for N-15 and Ne-21 enrichments. The cosmogenic production of N-15 is, in particular, unique. It promises to provide very valuable constraints on the temporal evolution of the martian CO2 and H2O, both in the atmosphere and regolith. The rate of production of cosmogenic (spallation) N-15 is dependent on the surface pressure of oxygen, the principal target element for formation of N-15. In view of the relatively high O/N ratio in the martian atmosphere, relatively high N-15/N ratio are expected to arise from cosmogenic reactions. The added bonus comes from the fact that an appreciable production of N-15 is expected in the martian regolith because of its thin atmosphere. From model calculations it is shown that if accurate isotopic composition data become available for N and Ne, it should be possible to put robust constraints on the time averages martian oxygen surface pressure and subsurface water in the upper layers. Author (revised)

N93-31948*# Argonne National Lab., IL. Chemical Technology Div.

PRELIMINARY RESULTS OF AN EXPERIMENTAL STUDY OF THE INTERACTIONS OF BASALT GLASS AND A WATER VAPOR ATMOSPHERE: IMPLICATIONS FOR WEATHERING ON MARS Abstract only

J. J. Mazer, J. K. Bates, and C. R. Bradley *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 19-20 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

Models of weathering processes on the surface of Mars invoke hydrothermal alteration as the primary mechanism responsible for clay formation. Previous experimental studies of basalt glass interactions with water under hydrothermal conditions demonstrate that phyllosilicates and zeolites are the primary alteration minerals. Gas-solid weathering is thought to be less thermodynamically favorable and relatively unimportant, however, the experimental alteration of basalt glass under vapor ion conditions (large SA/V) can result in the formation of clay minerals, zeolites, and hydrated calcium silicates. We have undertaken a study of the reacted layers formed on basalt glasses experimentally altered under vapor hydration conditions to resolve this issue. High SA/V ratios promote reaction product buildup in solution and promote alteration mineral formation. It was previously shown that these reaction conditions promote weathering processes similar to those found in nature for tektite glasses, rhyolitic glasses, and basalt glasses. The hydration of basalt glass is described for 100 percent relative humidity experiments at temperatures of 150, 175, and 200 C for up to 400 days. Preliminary characterization of the alteration layers with analytical electron and scanning microscopy suggest that the reaction mechanism includes precipitation of a smectite clay on the outermost surface of the glass. Between the clay and the unreacted glass is an amorphous gel-like phase (palagonite). Our results provide an experimental basis for proposing that basalt glass interactions with vapor atmospheres can be an important source of clay minerals. Author (revised)

N93-31949*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

MARS BRINE FORMATION EXPERIMENT Abstract only

Jeffrey M. Moore, Mark A. Bullock (Colorado Univ., Boulder.), and Carol R. Stoker *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 20-21 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

Evaporites, particularly carbonates, nitrates, and sulfates, may be major sinks of volatiles scavenged from the martian atmosphere. Mars is thought to have once had a denser, warmer atmosphere that permitted the presence of liquid surface water. The conversion of atmospheric CO2 into carbonate is hypothesized to have degraded the martian climate to its present state of a generally subfreezing, desiccated desert. The rate for such a conversion under martian conditions is poorly known, so the time scale of climate degradation by this process cannot be easily evaluated. If some models are correct, carbonate formation may have been fast at geological time scales. The experiments of Booth and Kieffer also imply fast (10(exp 6) - 10(exp 7) yr) removal of the missing CO2 inventory, estimated to be 1 - 5 bar, by means of carbonate formation. The timing of formation of many of the fluvial features observed on Mars is, in large part, dependent on when and how fast the atmosphere changed. A knowledge of the rate at which carbonates and nitrates formed is also essential for assessing the probability that life, or its chemical precursors, could have developed on Mars. No previous experiments have quantitatively evaluated the rate of solution for a suite of mobile anions and cations from unaltered minerals and atmospheric gases into liquid water under Mars-like conditions. Such experiments are the focus of this task. Author (revised)

N93-31950*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

EFFECT OF DCB EXTRACTION ON MOSSBAUER AND SPECTRAL DATA FOR A HAWAIIAN PALAGONITIC SOIL (PN-9): IDEN TIFICATION OF PIGMENTARY PHASES Abstract only

Richard V. Morris, D. C. Golden, J. F. Bell, III (National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.), H. V. Lauer, Jr. (Lockheed Engineering and Sciences Co., Houston, TX.), and J. B. Adams (Washington Univ., Seattle.) *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 21-23 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

The study of palagonitic soils is an active area of research in martian geoscience because the spectral and magnetic properties of a subset are spectral and/or magnetic analogues of martian bright regions. An understanding of the composition, distribution, and mineralogy of ferric-bearing phases for palagonitic soils forms, through spectral and magnetic data, a basis for inferring the nature of ferric-bearing phases on Mars. Progress has been made in this area, but the data set is incomplete, especially with respect to the nature of pigmenting phases. The purpose of this study is to identify the nature of the pigment for Hawaiian palagonitic soil PN-9 by using extraction procedures to selectively remove iron oxide phases. This soil was collected at the same locale as samples Hawaii 34 and VOL02. All three soils are good spectral analogues for martian bright regions. Author (revised)

N93-31951*# Brown Univ., Providence, RI.

SYSTEMATIC VARIATIONS IN THE SPECTRAL PROPERTIES OF BRIGHT REGIONS ON MARS Abstract only

Scott Murchie, John Mustard, Janice Bishop, James Head, Carle Pieters, and Stephane Erard (Paris Univ., Orsay, France.) *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 23-25 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

The color and albedo of the martian surface define two basic surface units, dark gray material interpreted as relatively unaltered 'rock' and bright reddish material interpreted as weathered 'soil'. Understanding the processes contributing to soil formation first requires assessment of the soil's composition and compositional diversity. We report first results of an investigation of the character and variability of Fe- and water-bearing phases in bright reddish materials using ISM data. We also explore implications of these results for chemical evolution of martian soil. Information on the composition and distribution of bright reddish material comes from three major sources: Viking images, measurements by the XRF and GCMS instruments on the Viking Landers, and spectroscopic data. The XRF experiment found nearly identical, Fe-rich major-element compositions comparable to weathered basalt. Soil water, amounting to approximately 1-3 wt. percent as measured by the GCMS, was liberated mostly by heating to greater than or equal to 350 C, suggesting that it is present in a chemically bound form. Spectroscopic studies have detected ferric oxide, probably hematite, as well as molecular water. However, the identities of major silicate phases have been controversial, with conflicting evidence

regarding phyllosilicates. Two main interpretations of this evidence have been proposed: Weathering of basaltic glasses by H2O and CO2 formed a mixture of oxides, salts, and metastable phyllosilicates such as montmorillonite and 'palagonite' formed when basaltic melt contacted ground ice or water. Palagonite is a hydrated basaltic glass containing dispersed ferric oxide, recrystallized in varying degrees to phyllosilicates. Typically it is aphanitic, although some examples contain phenocrysts. In either case, eolian redistribution is thought to have resulted in the material's global homogenization. Imaging spectroscopic data returned by the ISM instrument on Phobos 2 provide a powerful new basis for evaluating the composition and origin of martian soil because they are indicative of the presence and distribution of water- and Fe-bearing phases whose mineralogy is sensitive to the history of chemical weathering. Author (revised)

N93-31952*# Brown Univ., Providence, RI. Dept. of Geological Sciences.

COMPOSITION OF WEAKLY ALTERED MARTIAN CRUST: CLUES FROM IMAGING SPECTROSCOPY Abstract only

John F. Mustard, Scott L. Murchie, Stephane Erard (Paris Univ., Orsay, France.), and James W. Head *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 25-27 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

Two of the fundamental questions regarding chemical weathering on Mars concern the following topics: the chemical pathways by which pristine crustal rocks are altered to produce observed ferric ironbearing assemblages and inferred clay silicate, sulfate, and magnetic oxide phases; and the timing of the oxidative weathering. High spatial- and spectral-resolution imaging spectrometer data provide a tool to investigate aspects of these questions for material exposed on the surface of Mars. In this study, ISM imaging spectrometer data are used to develop an inventory of least-altered crustal materials and to quantitatively model the mineralogic composition of the weakly altered crustal rocks. Author (revised)

N93-31953*# New Mexico Univ., Albuquerque. Inst. of Meteorites.

CHEMICAL TRANSPORT DURING FORMATION AND ALTERATION OF MARTIAN IMPACT AND VOLCANIC DEPOSITS Abstract only

H. E. Newsom *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 27-29 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

Much of the surface of Mars, including volcanic and cratered terrains, probably experienced alteration and degassing processes. These processes may have depleted or enriched many important elements in surface materials, including bedrock, dust, and soils. The composition of the martian soil may represent the best estimate, for some elements, of the average composition of the martian crust, similar to the composition of loess created by glacial action on the Earth. The martian soil may represent the only convenient, globally or regionally averaged sample of the martian crust. In order to understand the composition of the source material for the soil, however, we need to understand the contributions of volcanic vs. impact sources for this material and the chemical fractionations involved in its production. The processes to be addressed include degassing of volcanic deposits, as observed in the Valley of Ten Thousand Smokes at Katmai, Alaska, and degassing of meltbearing impact ejecta as inferred for suevite ejecta sheets at the Ries Crater, and alteration or palagonitization of volcanic deposits, as documented for volcanos in British Columbia and many other volcanic terrains, and impact crater deposits. The process of palagonitization has been the subject of several studies with reference to Mars, and palagonite is a good analogue for the spectroscopic properties of the martian dust. The role of impact in cratering has not been as well studied, although other researchers have established that both degassing and alteration are common features of impact crater deposits. Other relevant sources of experimental data include the extensive literature on the corrosion of nuclear waste glass and leaching of shocked materials. Author (revised)

N93-31954*# San Francisco State Univ., CA. Dept. of Chemistry and Biochemistry.

REFLECTANCE SPECTROSCOPY AND GEX SIMULATION OF PALAGONITE AND IRON-RICH MONTMORILLONITE CLAY MIXTURES: IMPLICATIONS FOR THE SURFACE COMPOSITION OF MARS Abstract only

J. B. Orenberg, J. Handy, and R. Quinn *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 29-30 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

Because of the power of remote sensing reflectance spectroscopy in determining mineralogy, it has been used as the major method of identifying a possible mineral analogue of the martian surface. A summary of proposed martian surface compositions from reflectance spectroscopy before 1979 was presented by Singer et al. Since that time, iron-rich montmorillonite clay, nanocrystalline or nanophase hematite, and palagonite have been suggested as Mars soil analogue materials. Palagonite in petrological terms is best described as an amorphous, hydrated, ferric iron, silica gel. Montmorillonite is a member of the smectite clay group, and its structure is characterized by an octahedral sheet in coordination with two tetrahedral sheets in which oxygen atoms are shared. The crystal unity of montmorillonite is well defined in contrast to palagonite where it is considered amorphous or poorly crystalline at best. Because of the absence of the diagnostic strong 2.2-micron reflectance band characteristic of clays in the near-infrared (NIR) spectrum of Mars and palagonite and based upon a consideration of wide wavelength coverage (0.3-50 microns), Roush et al. concluded that palagonite is a more likely Mars surface analogue. In spite of the spectral agreement of palagonite and the Mars reflectance spectrum in the 2.2-micron region, palagonite shows poor correspondence with the results of the Viking LR experiment. In contrast, iron-rich montmorillonite clays show relatively good agreement with the results of the Viking LR experiment. This spectral study was undertaken to evaluate the spectral properties of mixtures of palagonite and Mars analogue iron-rich montmorillonite clay (16-18 wt. percent Fe as Fe2O3) as a Mars surface mineralogical model. Mixtures of minerals as Mars surface analogue materials have been studied before, but the mixtures were restricted to crystalline clays and iron oxides.

Author (revised)

N93-31955*# Brown Univ., Providence, RI.

USING THE VIKING BIOLOGY EXPERIMENTAL RESULTS TO OBTAIN CHEMICAL INFORMATION ABOUT MARTIAN REGOLITH Abstract only

Robert C. Plumb *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 30-31 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

Although initially formulated as biology experiments, most of the results produced by the Viking Labeled Release (LR), Gas Exchange (GEX), and Pyrolytic Release (PR) experiments have been reproduced by chemical means. The experiments do not need more study as 'biological' phenomena, but they do deserve much more careful consideration from a chemical viewpoint. They are the only 'wet-chemical' experiments that scientists have performed on another planet, but they have not found very general use as sources of scientific information. There is a large set of potentially useful chemical observations, e.g., the three resolvable and precisely measured kinetic components of the release of C-14-labeled gases, the thermal sensitivity and magnitudes of the oxidation reaction(s) of the LR experiments, the kinetics and magnitude of the O2 and CO2 release of the GEX experiments, the thermal sensitivity of the GEX results, the differences between the thermal sensitivity of the GEX and the thermal sensitivity of the LR responses, and the kinetics and magnitudes of the LR successive injection reabsorption effect. It should be possible to test many chemical aspects of hypothetical martian phenomena in experiments using the biology experimental configurations and derive much valuable information by comparisons with the Viking observations. Author (revised)

N93-31956*# Geological Survey, Denver, CO.

CHEMICAL MODELING CONSTRAINTS ON MARTIAN SURFACE MINERALOGIES FORMED IN AN EARLY, WARM, WET CLIMATE, AND SPECULATIONS ON THE OCCURRENCE OF PHOSPHATE MINERALS IN THE MARTIAN REGOLITH Abstract only

Geoffrey S. Plumlee, W. Ian Ridley, and Jeffrey D. DeBraal (Oregon Univ., Eugene.) *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 31-32 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

This is one in a series of reports summarizing our chemical modeling studies of water-rock-gas interactions at the martian surface through time. The purpose of these studies is to place constraints on possible mineralogies

formed at the martian surface and to model the geochemical implications of martian surficial processes proposed by previous researchers. Plumlee and Ridley summarize geochemical processes that may have occurred as a result of inferred volcano- and impact-driven hydrothermal activity on Mars. DeBraal et al. model the geochemical aspects of water-rock interactions and water evaporation near 0 C, as a prelude to future calculations that will model sub-0 C brine-rock-clathrate interactions under the current martian climate. In this report, we discuss reaction path calculations that model chemical processes that may have occurred at the martian surface in a postulated early, warm, wet climate. We assume a temperature of 25 C in all our calculations. Processes we model here include (1) the reaction of rainwater under various ambient CO2 and O2 pressures with basaltic rocks at the martian surface, (2) the formation of acid rain by volcanic gases such as HCl and SO2, (3) the reactions of acid rain with basaltic surficial materials, and (4) evaporation of waters resulting from rainwater-basalt interactions. Derived from text

N93-31957*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

INFRARED OPTICAL PROPERTIES OF MARS SOIL ANALOG MATERIALS: PALAGONITES Abstract only

Ted L. Roush (San Francisco State Univ., CA.) *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 32-33 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

The globally distributed bright soils on Mars represent products of chemical alteration of primary igneous materials. As such, understanding the chemistry and mineralogy of these soils provides clues about the nature of the parent materials and the type, duration, and extent of the chemical weathering environments on Mars. Such clues are key in developing an understanding of the interior and surficial processes that have operated throughout Mars' history to yield the surface as it is currently observed. The generally homogeneous nature of these soils is illustrated by a variety of observational data. These data include (1) direct determination of elemental abundances by the X-ray fluorescence instruments on both Viking Landers, (2) Earth-based telescopic observations, and (3) space-based observations. Based on their spectral properties in the visible and near-infrared, terrestrial palagonitic soils have been suggested as analogs for the bright regions on Mars. Palagonites represent the weathering products of basaltic glass and as such are composed of a variety of minerals/materials. In order to gain an understanding regarding the chemical, mineralogical, and spectral properties of a broad suite of palagonites, several samples were collected from the eastern and central regions of the island of Hawaii. Derived from text

N93-31958*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

THE MARTIAN OCEAN: FIRST ACID, THEN ALKALINE Abstract only

M. W. Schaefer (Maryland Univ., College Park.) *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 33-34 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

In Mars' distant past, carbon dioxide and water may have been plentiful. Values of total outgassed CO2 from several to about 10 bar are consistent with present knowledge, and this amount of CO2 implies an amount of water outgassed equal to an equivalent depth of 500 to 1000 m. It is quite reasonable, therefore, to envision an early Mars in which there was a body or bodies of liquid water, perhaps in the northern plains, and a dense carbon dioxide atmosphere. Under such conditions, the pH of the water will be low, due to the dissolution of carbon dioxide in the water to form carbonic acid. This acidic water is capable of weathering the available rock quite intensely, particularly because this rock is likely to be heavily fractured (from meteorite bombardment) or even consist of fine particles (such as pyroclastic deposits). As time goes on, however, the carbon dioxide atmosphere will rapidly pass through the ocean to form carbonate deposits. As the density of the atmosphere decreases, so will the flux of carbonic acid into the ocean. Without this input of carbonic acid, the effect of the dissolved weathering products will be to increase the pH of the water. The ocean will then become alkaline. To study this process, I have developed a geochemical cycle model for the atmosphere-hydrosphere-regolith system of Mars. The treatment of geochemical cycles as complex kinetic chemical reactions has been undertaken for terrestrial systems in recent years with much success. This method is capable of elegantly handling the interactions between the simultaneous chemical reactions needed to understand such a system. Derived from text

N93-31959*# California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.

EXPERIMENTAL INVESTIGATION OF CARBONATE FORMATION ON MARS Abstract only

Stuart K. Stephens, David J. Stevenson, and Leon F. Keyser (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 34-36 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

If Mars had an early dense CO2 atmosphere (greater than 1 bar), then the transition to the present low pressure (7 mbar) may require carbonate formation without liquid water (e.g., although the early greenhouse has been questioned on the basis that modeled CO2 condensation prevents buildup of such a pressure). Our experiments have focused on the kinetics of such 'dry' reactions. Booth and Kieffer suggested rates consistent with removal of greater than 1 bar of CO2 over geologic time, but their results were questionable since their reactions did not proceed beyond one monolayer of carbonate formed on powdered silicate under martian conditions. Theoretical considerations implied that if nonporous rinds formed, then the rate of carbonate formation would be limited by diffusion, not reaction. Therefore, our experiments optimize reaction conditions to test for continued carbonate production, as well as to verify previous conclusions for initial growth of carbonate. Author

N93-31960*# Arizona State Univ., Tempe. Dept. of Geology.

WEATHERING PROCESSES IMPLIED FROM ANALYSIS OF SMALL MARTIAN AVALANCHE CHUTES Abstract only

R. Sullivan *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 36-37 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

It has been proposed that the smaller features of martian spur and gully slope morphology, located along the upper walls of Valles Marineris, are avalanche chutes. A three-dimensional stability back-analysis technique was developed and applied to these small avalanche chutes, yielding average values of cohesion and angle of internal friction for the mobile layer materials on these slopes at the time of each slope failure. Generally, the analysis showed that at the time of each slope failure material strengths had been reduced to those of moderately cohesive debris down through depths of tens of meters. These results have implications and possible constraints for the nature and rate of martian weathering processes. Derived from text

N93-31961*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

GEOCHEMISTRY AND SETTING OF MARTIAN WEATHERING: THE LAFAYETTE METEORITE Abstract only

A. H. Treiman, R. A. Barrett (Lockheed Engineering and Sciences Co., Houston, TX.), and J. L. Gooding *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 37-39 (For primary document see N93-31933 12-91)

Avail: CASI HC A01/MF A01

Lafayette, one of the SNC (martian) meteorites, contains preterrestrial alteration materials rich in smectite and ferric oxides. The compositions and textures of the veinlets suggest that they were formed in episodic alteration events by waters that contained a relatively small load of dissolved salts. The Lafayette achondrite, one of the nakhlites of probable martian origin, is an igneous rock consisting mostly of augite and olivine, with interstitial feldspar, sulfides (pyrite), high-Si glass, and other phases. Like Nakhla itself, Lafayette contains veinlets of hydrous alteration materials. We studied thin sections of sample ME2116 (Field Museum, Chicago), using scanning and transmission electron microscopy (SEM and TEM) with energy dispersive X-ray spectrometry (EDS). Derived from text

N93-31962*# Open Univ., Milton (England). Dept. of Earth Sciences.
ATTEMPTS TO COMPREHEND MARTIAN SURFACE PROCESSES THROUGH INTERPRETATION OF THE OXYGEN ISOTOPIC COMPOSITIONS OF CARBONATES IN SNC METEORITES Abstract Only
I. P. Wright, C. T. Pillinger, and Monica M. Grady (Museum of Natural History, London, England.) *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 39-41 (For primary document see N93-31933 12-91)
Avail: CASI HC A01/MF A01

The SNC meteorites are known to contain trace quantities of a variety of secondary minerals such as carbonates, sulfates, and aluminosilicates. Since these constituents are thought to be mostly preterrestrial in origin, their study has the potential to provide rigorous constraints on the nature of martian weathering processes. However, this line of investigation is potentially complicated by the presence within the meteorite samples of any additional weathering products produced by terrestrial processes. Examination of such terrestrial components is important since weathering processes that affect meteorite samples following their fall to Earth might have some bearing on the nature of analogous processes at the surface of Mars. It is obviously necessary to try and distinguish which secondary components in SNC meteorites are terrestrial in origin from those that are preterrestrial. Herein consideration is made of the stable isotopic compositions of weathering products in two SNC meteorites: EET A79001 (a sample collected from Antarctica) and Nakhla (a fall from Egypt, 1911). Derived from text

N93-31963*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
CHEMICAL REACTIVITY OF THE MARTIAN SOIL Abstract only
A. P. Zent and C. P. McKay *In* Lunar and Planetary Inst., MSATT Workshop on Chemical Weathering on Mars 12 Sep. 1992 p 41-42 (For primary document see N93-31933 12-91)
Avail: CASI HC A01/MF A01

The Viking life sciences experimental packages detected extraordinary chemical activity in the martian soil, probably the result of soil-surface chemistry. At least one very strong oxidant may exist in the martian soil. The electrochemical nature of the martian soil has figured prominently in discussions of future life sciences research on Mars. Putative oxidants in the martian soil may be responsible for the destruction of organic material to considerable depth, precluding the recovery of reducing material that may be relic of early biological forms. Also, there have been serious expressions of concern regarding the effect that soil oxidants may have on human health and safety. The concern here has centered on the possible irritation of the respiratory system due to dust carried into the martian habitat through the air locks. Derived from text

N93-31691# Space Technology Ireland Ltd., Maynooth.
ENERGETIC PARTICLES (GREATER THAN 34 KeV - 3.2 MeV) IN THE DEEP MARTIAN MAGNETOTAIL (X = 15.5 R(SUB M)), MODELING OF THE MARTIAN BOW SHOCK AND THE INFLUENCE OF LOW SOLAR WIND PRESSURE ON MARS AS AN OBSTACLE
S. M. P. McKenna-Lawlor and V. V. Afonin (Academy of Sciences, USSR, Moscow.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 107-111 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31699# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (Germany).
OBSERVATION OF PARTICLE BURSTS IN THE TAIL OF PLANET MARS ONBOARD THE PHOBOS 2 SPACECRAFT
E. Kirsch, S. McKenna-Lawlor (Saint Patrick's Coll., Maynooth, Ireland.), V. V. Afonin (Academy of Sciences, USSR, Moscow.), K. Schwingenschuh (Institut fuer Weltraumforschung, Graz, Austria.), E. Keppler, M. Witte, D. OSullivan (Dublin Inst. for Advanced Studies, Ireland.), and A. Thompson (Dublin Inst. for Advanced Studies, Ireland.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 177-180 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation.*

N93-31343# European Space Agency, Paris (France).
PROCEEDINGS OF THE FIRST SOHO WORKSHOP: CORONAL STREAMERS, CORONAL LOOPS, AND CORONAL AND SOLAR WIND COMPOSITION
C. Mattok, ed. Nov. 1992 392 p Workshop held in Annapolis, MD, 25-28 Aug. 1992
(ESA-SP-348; ISBN-92-9092-234-6; ETN-93-93945) Copyright Avail: CASI HC A17/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The proceedings of the first Soho (Solar and Heliospheric Observatory) workshop are presented. The ESA/NASA Soho mission is scheduled for launch in Jul. 1995. The workshops aim at focusing on the mission objectives, in order to maximize the scientific return. An overview of the Soho mission is given and the expected performances of the instruments are described. Only the instruments that will observe and measure plasma diagnostic parameters, both by remote sensing of the solar corona and by in situ sampling of the solar wind, are presented. Topical papers on coronal streamers, coronal loops, coronal and solar wind composition, and future activities, are presented. For individual titles, see N93-31344 through N93-31426.

N93-31344# Paris XI Univ., Orsay (France). Inst. d'Astrophysique.
SOHO OVERVIEW AND PREPARATION FOR OPERATIONS
A. H. Gabriel *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 5-8 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

An overview of the particular scientifc qualities of the SOHO (Solar and Heliospheric Observatory) mission is given. The operations phase will need to take account of the importance of coordinated observations between many instruments. Feedback, from quick look data evaluation, into the daily planning cycle is an essential requirement for the success. Much work remains in planning detailed scientific sequences for joint observations. ESA

N93-31345*# Stanford Univ., CA. Space Science and Astrophysics Center.
THE SOLAR OSCILLATIONS INVESTIGATION: MICHELSON DOPPLER IMAGER
J. Todd Hoeksema, P. H. Scherrer, R. I. Bush, A. Title (Lockheed Aircraft Corp., Palo Alto, CA.), and T. Tarbell (Lockheed Aircraft Corp., Palo Alto, CA.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 9-12 (For primary document see N93-31343 12-92)
(Contract NAS5-30386)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The Solar Oscillations Investigation (SOI) developed the Michelson Doppler Imager (MDI) to investigate the properties of the solar interior using the tools of helioseismology and of the photosphere and corona using more conventional techniques. The fundamental goal is to understand the Sun by determining its structure and observing its dynamics. The basic observables, velocity, intensity, and magnetic field, are computed on board from up to twenty 1024 by 1024 filtergrams made each minute. Subsequent analysis will extend the region to be explored downward into the solar interior and upward into the corona. While the instrument is dedicated to producing an uninterrupted series of helioseismology data, several magnetograms will be made each day and special eight hour campaigns are being developed to address specific scientific questions, some in coordination with other SOHO (Solar and Heliospheric Observatory) instruments. ESA

N93-31346*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
SUMER: TEMPERATURES, DENSITIES, AND VELOCITIES IN THE OUTER SOLAR ATMOSPHERE

Philippe Lemaire (Paris XI Univ., Orsay, France.), K. Wilhelm (Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau, Germany.), W. I. Axford (Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau, Germany.), W. Curdt (Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau, Germany.), A. H. Gabriel (Paris XI Univ., Orsay, France.), M. Grewing (Tuebingen Univ., Germany.), M. C. E. Huber, Stuart D. Jordan, M. Kuehne (Physikalisch-Technische Bundesanstalt, Berlin, Germany.), and Eckart Marsch (Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau, Germany.) et al *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 13-16 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The SUMER (Solar Ultraviolet Measurement of Emitted Radiation) instrumentation that will be mounted on the SOHO (Solar and Heliospheric Observatory) spacecraft is in development. It has some capability of improving the solar angular resolution and the spectral resolution already obtained in the far UV to the extreme UV, corresponding to the temperature range between 10,000 and a few 1,000,000 K. Some insights into the SUMER spectrometer, developed to study the dynamics and to infer temperatures and densities of the low corona and the chromosphere-corona transition zone in using the 50 to 160 nm wavelength range, are given. The SUMER scientific goals and the techniques used are outlined. The instrumentation and the expected performances are described. The way the observations can be conducted is emphasized and the operation of SUMER in coordination with other SOHO instrumentations and in cooperation with ground based observations is explained. ESA

N93-31347# Rutherford Appleton Lab., Chilton (England). Astrophysics Div.

THE CORONAL DIAGNOSTIC SPECTROMETER FOR THE SOLAR AND HELIOSPHERIC OBSERVATORY

Richard A. Harrison and Eric C. Sawyer *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 17-19 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The Coronal Diagnostic Spectrometer (CDS) is designed to probe the solar atmosphere through the analysis of spectral emission lines in the extreme ultraviolet wavelength range 150 to 800 A. By observing the absolute and relative intensities of selected lines and line profiles, the temperature, density, flow, and abundance information for the plasmas in the solar atmosphere are derived. Simultaneous coverage of large wavelength bands combined with spatial and temporal resolutions of a few arc seconds and down to 1 second will provide a unique tool for pursuing the goals of SOHO (Solar and Heliospheric Observatory). ESA

N93-31348*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

SOLAR CORONA SYNOPTIC OBSERVATIONS FROM SOHO WITH AN EXTREME ULTRAVIOLET IMAGING TELESCOPE Abstract Only

Jean-Pierre Delaboudiniere (Centre National de la Recherche Scientifique, Verrieres-Le Buisson, France.), A. H. Gabriel (Centre National de la Recherche Scientifique, Verrieres-Le Buisson, France.), G. E. Artzner (Centre National de la Recherche Scientifique, Verrieres-Le Buisson, France.), Ken Dere (Naval Research Lab., Washington, DC.), Russell A. Howard (Naval Research Lab., Washington, DC.), D. Michels (Naval Research Lab., Washington, DC.), Richard Catura (Lockheed Aircraft Corp., Palo Alto, CA.), J. Lemen (Lockheed Aircraft Corp., Palo Alto, CA.), R. Stern (Lockheed Aircraft Corp., Palo Alto, CA.), and Joseph B. Gurman et al *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 21 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The major scientific objective of the EUV Imaging Telescope (EIT) is to study the evolution of coronal structure over a wide range of spatial and temporal scales and temperatures. A second strategic objective is to provide full disk synoptic maps of the global corona to aid in unifying SOHO (Solar and Heliospheric Observatory)/Cluster investigations. EIT will also provide images to support the planning of detailed spectroscopic investigations by the CDS (Coronal Diagnostic Spectrometer) and SUMER spectrometers in SOHO. EIT observations will be made in four narrow spectral bands, centered at 171 A (Fe 9), 195 A(Fe 12), 284 A (Fe 15), and 304 A (He 2) representing restricted temperature domains within a wide temperature range from 40,000 to 3,000,000 K. The results will be images of the solar atmosphere from the upper chromosphere and transition region to the active region corona. These maps, made at appropriate time intervals, will be used to study the fine structures in the solar corona and to relate their dynamic properties to the underlying chromosphere and photosphere. Dynamic events in the inner corona will be related to white light transients in the outer corona, and observations of the internal structure of coronal holes will be used to investigate origins of the solar wind. ESA

N93-31349# Harvard-Smithsonian Center for Astrophysics, Cambridge, MA.

UVCS: THE ULTRAVIOLET CORONOGRAPH SPECTROMETER FOR SOHO

John L. Kohl and Giancarlo Noci (Florence Univ., Italy.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 23-26 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The Ultraviolet Coronagraph Spectrometer (UVCS) will provide spectroscopic observations of the solar corona out to 10 solar radii from Sun center. This capability is expected to expand greatly the number of plasma parameters that can be specified by remote sensing techniques. The UVCS plasma diagnostic techniques are expected to provide a sufficient number of empirically derived parameters to significantly constrain theories of solar wind acceleration, coronal heating, and solar wind composition. The measured line profiles and intensities are sensitive to random velocity distributions, densities of coronal protons, electrons, and ions. ESA

N93-31350*# Hulburt (E. O.) Center for Space Research, Washington, DC.

THE LARGE ANGLE SPECTROSCOPIC CORONAGRAPH (LASCO): VISIBLE LIGHT CORONAL IMAGING AND SPECTROSCOPY

Guenter E. Brueckner, Russell A. Howard, Martin J. Koomen, C. Korendyke, D. J. Michels, D. G. Socker, Philippe Lamy (Laboratoire d'Astronomie Spatiale, Marseille, France.), Antoine Llebaria (Laboratoire d'Astronomie Spatiale, Marseille, France.), J. Maucherat (Laboratoire d'Astronomie Spatiale, Marseille, France.), and Rainer Schwenn (Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau, Germany.) et al *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 27-34 (For primary document see N93-31343 12-92)

(NASA Order S-93830 D)

Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The Large Angle Spectroscopic Coronagraph (LASCO) is a triple coronagraph being jointly developed for the Solar and Heliospheric Observatory (SOHO) mission. LASCO comprises three nested coronagraphs (C1, C2, and C3) that image the solar corona for 1.1 to 30 solar radii (C1: 1.1 to 3 solar radii, C2: 1.5 to 6 solar radii, and C3: 3 to 30.0 solar radii). The inner coronagraph (C1) is a newly developed mirror version of the classic Lyot coronagraph without an external occultor, while the middle coronagraph (C2) and the outer coronagraph (C3) are externally occulted instruments. High resolution coronal spectroscopy from 1.1 to 3 R solar radii can be performed by using a Fabry-Perot interferometer, which is part of C1. High volume memories and a high speed microprocessor enable extensive onboard image processing. Image compression by factors of 10 to 20 will result in the transmission of 10 to 20 full images per hour. ESA

N93-31351# Centre National de la Recherche Scientifique, Verrieres-Le Buisson (France). Service d'Aeronomie.

SWAN: A STUDY OF SOLAR WIND ANISOTROPIES

Jean-Loud Bertaux, E. Dimarellis, F. Goutail, E. Chassefiere, Rosine Lallement, Erkki Kyrola (Finnish Meteorological Inst., Helsinki.), I. Liede (Finnish Meteorological Inst., Helsinki.), R. Pellinen (Finnish Meteorological Inst., Helsinki.), P. Riihela (Finnish Meteorological Inst., Helsinki.), and W.

Schmidt (Finnish Meteorological Inst., Helsinki.) et al *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 37 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The principle scientific objective of SWAN is to investigate the latitude distribution of the solar wind. This objective is fulfilled by mapping the emissivity of the interplanetary Lyman alpha light. The link between the Lyman alpha light and the solar wind is the interplanetary hydrogen gas which scatters the solar Lyman alpha photons and is ionized by solar wind protons. Besides the solar wind, the SWAN instrument increases knowledge of the properties of interplanetary hydrogen. The heliopause signature, comets, and the solar coronal observations are the secondary objectives of SWAN. The mapping of the celestial sphere is accomplished by two identical sensor units placed on the opposite sides of SOHO (Solar and Heliospheric Observatory). Each sensor consists of a two mirror sensor head (for 2(pi) str coverage), a hydrogen cell (for a line analysis), and a detector. The detector consists of a microchannel plate and a 5 by 5 anode array. ESA

N93-31352*# Max-Planck-Inst. fuer Extraterrestrische Physik, Garching (Germany).
THE CHARGE, ELEMENT, AND ISOTOPE ANALYSIS SYSTEM CELIAS ON SOHO
Dietrich Hovestadt *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 39-42 Sponsored in part by NASA, Washington; Deutsche Agentur fuer Raumfahrtangelegenheiten G.m.b.H.; Swiss National Foundation for Scientific Research; and ESA (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The CELIAS instrument is designed to study the composition of the Solar Wind (SW) and of solar and interplanetary accelerated energetic particles on SOHO (Solar and Heliospheric Observatory). It consists of three different sensors with associated electronics, which are optimized each for a particular aspect of ion composition. These aspects are the elemental, isotopic, and ionic charge compostion of SW or energetic ions emanating from the Sun. A fourth sensor, the Solar EUV Monitor (SEM) was included into CELIAS for monitoring the absolute EUV flux from the Sun. ESA

N93-31353# Kiel Univ. (Germany). Inst. fuer Reine und Angewandte Kernphysik.
COSTEP: COMPREHENSIVE SUPRATHERMAL AND ENERGETIC PARTICLE ANALYSER FOR SOHO: SCIENTIFIC GOALS AND DATA DESCRIPTION
Horst W. Kunow, R. Mueller-Mellin, H. Sierks, S. McKenna-Lawlor (Saint Patrick's Coll., Maynooth, Ireland.), and J. Sequeiros (Alcala de Henares Univ., Madrid, Spain.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 43-46 Sponsored in part by Dept. of Industry and Commerce (For primary document see N93-31343 12-92)
(Contract DARA-50-OC-8910; CICYT-ESP-88-0306)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The COSTEP instruments LION (Low energy Ion and electron instruments) and EPHIN (Electron Proton Helium Instrument) measure electrons and protons above 40 keV up to above 5 MeV for electrons and greater than 53 MeV for protons. Helium is detected above 6 MeV and helium isotopes are seperated between 4 and 53 MeV/n. The instruments are designed to detect sufficiently large samples of solar atmospheric material also at low intensity solar particle events to correlate its results with the observations by the other particle instruments on board and with the observations of the optical instruments on board SOHO (Solar and Heliospheric Observatory). Descriptions of the instruments and the data format are given and possible correlative data evaluation is discussed. ESA

N93-31354# Turku Univ. (Finland). Space Research Lab.
ENERGETIC PARTICLE ANALYSER ERNE
Jarmo Torsti, E. Valtonen, T. Eronen, E. Hoisko, M. Louhola, M. Lumme, A. Nieminen, P. Peltonen, E. Riihonen, and G. Schulz et al *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 47-50 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The Energetic and Relativistic Nuclei and Electron (ERNE) experiment will investigate the solar atmosphere and the heliosphere by detecting particles produced in various kinds of energy release processes. The instrument will measure the energy spectra of elements in the range Z = 1 to 30. It will also measure the abundance ratios of isotopes as well as the anisotropy of the particle flux. The isotopic resolution varies with particle type and energy; for example, resolution of carbon isotope is sigma(sub m) = 0.25 amu in the energy range 20 to 140 MeV/nucleon. ESA

N93-31355# Los Alamos National Lab., NM.
THEORY OF CORONAL STREAMER FORMATION
Roger A. Kopp *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 53-61 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Conceptually, coronal streamers can form (and disappear) by either of two distinct processes: plasma filling and outward distention of a pre-existing closed magnetic structure; and magnetic reconnection, for whatever reason, of an open bipolar field configuration. An argument that the majority of stable appearing streamers on the Sun at any time are in fact of the latter category, namely, open field structures undergoing gradual reconnection, is made. Quasi-steady (convectively relaxed) reconnection models may be required to explain the narrow high density cores exhibited by most streamers out to distances of many solar radii. Some of the observational signatures of reconnection within streamers, which the instrumentation aboard SOHO (Solar and Helospheric Observatory) may be capable of detecting, are discussed. ESA

N93-31356*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
MODELING SOLAR CORONAL STREAMERS
Steven T. Suess *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 63-72 Sponsored in part by Italian Space Agency (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Coronal streamer models must now make the transition from research projects to applications tools. SOHO (Solar and Heliospheric Observatory) will be making measurements on plasma parameters in and around streamers and a quantitative model will be required for interpreting the data. The reason for this is that a streamer is inherently a magnetohydrodynamic phenomenon; its properties are determined both by the magnetic field and the dynamics of the plasma. The purpose of the model will be to analyze the energetics of the streamer and place the results into the context of the magnetic field. Current streamer modeling, and why it has taken so long for these models to develop into useful tools, is described and indications on where further development is needed, are given. ESA

N93-31357# Institut d'Astrophysique, Paris (France).
STREAMER ECLIPSE OBSERVATIONS
Serge Koutchmy *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 73-82 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Thanks to the availability of a large radiative flux in the optical region, solar total eclipses are rare occasions offering the opportunity of using sophisticated methods to analyze all parts of the highly structured white light corona. Coronal absolute intensities and line emissions, including their polarization, are studied to analyze density and temperature inhomogeneities, velocities and magnetic fields. Detailed density distribution is directly extracted from fine coronal structures. During the 1991 eclipse, the large

3.6 m aperture CFH (Canada France Hawaii) optical telescope was used to analyze time sequences over small coronal fields and to reach the finest structure; results from this experiment are presented including the analysis of the faintest detected feature and small scale dynamical plasma processes. To prepare the SOHO (Solar and Heliospheric Observatory) mission on coronal physics, an overview of what is known on coronal structures from eclipse observations of the past solar cycles is given. The nonpotential nature of the coronal magnetic field is well illustrated by the large deviation of streamers from the radial direction as well as by the systematic occurrence of tangential discontinuities at edges of streamers. ESA

N93-31358# Air Force Geophysics Lab., Sunspot, NM.
GROUND-BASED CORONAGRAPHIC OBSERVATIONS OF SOLAR STREAMERS
Richard C. Altrock *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 83-86 Sponsored in part by NSF Prepared in cooperation with National Solar Observatory, Sunspot, NM (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A study which aims to demonstrate that ground based coronographs can observe coronal streamers and to give examples of the type of streamer properties that can be deduced from such observations is reported. Eclipse or balloonborne observations are not discussed. The emission line and white light (K coronagraph) observations relating to streamer electron density, magnetic field and polarization, population, intensity, large scale organization, rotation, temperature, and periodicities, are included. All known papers in this field are not reviewed but selected papers to demonstrate the types of work that can be done are used. ESA

N93-31359# Maryland Univ., College Park. Dept. of Astronomy.
RADIO OBSERVATIONS OF CORONAL STREAMERS
Mukul R. Kundu *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 87-92 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Some radio observations of coronal streamers, obtained at meter-decameter wavelengths, using the Clark Lake (U.S.) multifrequency radioheliograph, are presented. Using daily imaging observations, synoptic charts similar to white light coronagraph synoptic charts were generated, and radio brightness enhancements were compared with bright coronal streamers. By using several frequencies simultaneously, it was possible to construct three dimensional structures of coronal streamers. Type 3 producing electrons are shown to propagate in coronal streamers. The relative predictions of type 3 burst sources and coronal streamers as observed by HAO C/P experiment aboard SMM are compared; the paths of type 3 emitting electrons in dense coronal streamers are inferred; from multifrequency observations, electron density distributions above active regions near the limb are derived. ESA

N93-31360*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
PREDICTING LY-ALPHA INTENSITIES IN CORONAL STREAMERS
Giancarlo Noci (Florence Univ., Italy.), Giannina Poletto (Osservatorio Astrofisico di Arcetri, Florence, Italy.), Steven T. Suess, A.-H. Wang (Alabama Univ., Huntsville.), and S. T. Wu (Alabama Univ., Huntsville.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 93-96 Sponsored in part by Italian Space Agency; Gruppo Nazionale di Astronomia; and Ministry of Univ. and Research and Scientific Technology (For primary document see N93-31343 12-92)
(Grant NAGw-9)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

SOHO (Solar and Heliospheric Observatory) UVCS (Ultraviolet Coronagraph Spectrometer) will make long term observations of coronal streamers in UV lines, providing a new tool for the analysis of structures which have been known for decades but are still far from being adequately described. Work to evaluate the Lyman alpha brightness of coronal streamers is reported, adopting the streamer models obtained, via a time dependent numerical relaxation technique. This will yield understanding on the role of geometric versus physical factors in determining the streamer lyman alpha intensity and provide guidelines for UVCS observational operations. Future prospects along this line of research are summarized. ESA

N93-31361*# California Univ., San Diego, La Jolla. Astrophysics and Space Science Center.
A MODEL FOR CORONAL STREAMER OBSERVATIONS USING THE SOHO CORONAGRAPH INSTRUMENTATION
Bernard V. Jackson *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 97-99 (For primary document see N93-31343 12-92)
(Grants NAGw-2002; AF-AFOSR-0091-91)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The SOHO (Solar and Heliospheric Observatory) coronagraphs will offer an unprecedented opportunity to observe coronal streamer material and determine its outward motion. The inner C1 and C2 coronagraphs should enable ready identification of coronal streamers and their surface manifestations. The outer C3 coronagraph should be able to trace streamers to nearly interplanetary distances from the Sun. Using a modeling program designed to determine parameters from co-rotating heliospheric material viewed by the Helios spacecraft, the locations in position angle and distance from the Sun of several modeled streamers are shown. These models demonstrate the expected differences in streamer location when different assumptions are used for the outward acceleration of the streamer material. ESA

N93-31362# Colorado Univ., Boulder. Dept. of Astrophysical, Planetary and Atmospheric Sciences.
MODELLING THE LARGE SCALE STRUCTURE OF THE SOLAR CORONA
Sarah Gibson and F. Bagenal *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 101-104 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A quantitative description of the large scale structure of magnetic field and density distribution in the coronal plasma is found. The magnetostatic model of Bogdan and Low and white light images from both NASA's Solar Maximum Mission (SMM) Coronagraph/Polarimeter and the High Altitude Observatory Mark 3 (MK3) K coronameter are used. This is an extension of previous work which used only the Mk3 data. The SMM data were considerably less noisy than the Mk3 data for radii higher than about 1.5 solar radii, particularly at mid-to-high latitude. By combining the SMM and Mk3 datasets, a density distribution that matched the white light images of the corona was more accuratly obtained. The model then allows calculation of the magnetic field and plasma characteristics (such as the coronal temperature structure) which are essential for understanding the mechanisms that heat the corona and drive the solar wind. ESA

N93-31363# Catania Astrophysical Observatory (Italy).
LY-ALPHA RADIATION FROM CORONAL TRANSIENTS
Daniele Spadaro, R. Ventura, R. Martin (Turin Univ., Italy.), S. T. Wu (Alabama Univ., Huntsville.), and A. H. Wang (Alabama Univ., Huntsville.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 105-108 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The intensity and profile of the Lyman alpha spectral line expected from the extended coronal plasma evolving during a coronal transient, when observed in the plane of the sky in the range of heliocentric distance 1.5 to 4 solar radii, are calculated. The numerical values of temperature, density and outflow speed inside the coronal transient are those determined by Wu and Wang under the assumption of a single fluid, three dimensional, time dependent magnetohydrodynamic model of the outer solar atmosphere. The dependence of the Lyman alpha line on the physical parameters of

the examined structure is discussed. These results may help in preparing and interpreting UVCS/SOHO (Ultraviolet Coronagraph/Solar and Heliospheric Observatory) observations of coronal transients. ESA

N93-31364# Colorado Univ., Boulder. Atmospheric and Space Physics Lab.

OBSERVATIONAL CONSTRAINTS ON CORONAL HOLE DENSITY MODEL

Madhulika Guhathakurta *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 109-112 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Measuring the polarization brightness (pB) intensity inside a polar coronal hole is an extremely difficult process and the signal to noise ratio is rather low. Under these circumstances, it is sometimes possible to over interpret the data. For example, analysis of white light coronagraph observations of a polar coronal hole during Jun. 29 - Jul. 13 1973 led Munro and Jackson (MJ) to infer that the density inside the hole varied as a function of r (heliocentric north) and theta (colatitude). However, recent analysis of the white light data during Dec. 3 1973 - Jan. 24 1974, indicate that the density inside a polar coronal hole, within limits of uncertainties inherent in the coronal white light observations, is consistent with the interpretation that it is a function of r only. The inherent uncertainties in the observed pB data are discussed and the data from the Munro and Jackson period are reexamined. Results demonstrate that within limits of inherent uncertainty in the polar coronal pB measurements, the density inside a polar coronal hole is independent of magnetic latitude and longitude. The angular width of the coronal hole obtained by MJ is smaller than this study estimated and the divergence is slightly higher than that of MJ. The present model should have significant impact in terms of understanding the hydrodynamic structure of the corona. ESA

N93-31365*# Maryland Univ., College Park. Dept. of Astronomy.

OBSERVATIONS OF STATIONARY RADIO SOURCES: CORONAL POLAR PLUMES?

Natchimuthkonar Gopalswamy, Edward J. Schmahl, and Mukul R. Kundu *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 113-115 (For primary document see N93-31343 12-92)

(Grants NAGw-2760; NAGw-1541; NSF ATM-90-19893)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Observations and preliminary results of polar radio sources which are often brighter than streamers are presented. The results are preliminary and an analysis is needed using a larger data set to firmly establish the properties such as time variability of these sources. Data which are not corrected for ionospheric refraction are used, thus the determination of rotational characteristics is not accurate. Thermal and/or weak nonthermal emission from polar plumes may be responsible for the polar radio sources. However, nonthermal process may be necessary to explain time variability. ESA

N93-31366# Stanford Univ., CA. Space Science and Astrophysics Center.

A MAGNETOSTATIC CORONAL MODEL WITH HORIZONTAL ELECTRIC CURRENTS: MODELING THE CORONAL STREAMER BELT

Xue-Pu Zhao and J. Todd Hoeksema *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 117-120 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Using the photospheric magnetic fields measured at the Wilcox Solar Observatory as the input to the Bogdan and Low magnetostatic atmosphere model, the large scale magnetic field and plasma properties above the solar surface can be calculated. The calculated electron structures generally match the HAO (High Altitude Observatory) synoptic charts of the white light corona near solar minimum. The calculated magnetic configurations maintain a basically potential field configuration. It is planned to test how well the model can predict the magnetic field and plasma properties in coronal holes and corona streamers on the basis of the expected high quality SOHO (Solar and Heliospheric Observatory) observations of the photospheric field and plasma properties. ESA

N93-31367*# Harvard-Smithsonian Center for Astrophysics, Cambridge, MA.

SIMULATED O VI DOPPLER DIMMING MEASUREMENTS OF CORONAL OUTFLOW VELOCITIES

Leonard Strachan, L. D. Gardner, and John L. Kohl *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 121-124 (For primary document see N93-31343 12-92)

(Grant NAG5-613)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The possibility of determining O(5+) outflow velocities by using a Doppler dimming analysis of the resonantly scattered intensities of O VI lambda 1031.9 and lambda 1037.6 is addressed. The technique is sensitive to outflow velocities, W, in the range W greater than 30 and less than 250 km/s and can be used for probing regions of the inner solar corona, where significant coronal heating and solar wind acceleration may be occurring. These velocity measurements, when combined with measurements of other plasma parameters (temperatures and densities of ions and electrons) can be used to estimate the energy and mass flux of O(5+). In particular, it may be possible to locate where the flow changes from subsonic to supersonic and to identify source regions for the high and low speed solar wind. The velocity diagnostic technique is discussed with emphasis placed on the requirements needed for accurate outflow velocity determinations. Model determinations of outflow velocities based on simulated Doppler observations are presented. ESA

N93-31368*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

SPEEDS AND ACCELERATIONS OF CORONAL MASS EJECTIONS

Abstract Only

O. Chris St.Cyr, A. J. Hundhausen (National Center for Atmospheric Research, Boulder, CO.), and J. T. Burkepile (National Center for Atmospheric Research, Boulder, CO.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 125 Sponsored in part by NSF (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

More than 1300 coronal mass ejections have been detected in observations made by the coronagraph aboard SMM during 1980 and 1984-1989. The speed (projected onto the plane of the sky) for at least one morphoplogical feature in about half of these mass ejections could be measured. The average speed of all mass ejection features was about 350 km/s, but speeds range from a few 10s of km/s to more than 2000 km/s. There also appear to be significant variations between the speed distributions for different years. When a mass ejection feature appeared in three or more sequential images, its acceleration could also be calculated. But, because of the limited time a mass ejection remained in the SMM field of view, the ability to detect any given acceleration diminished with increasing mass ejection speed. In fact, the SMM observations do not reveal a discernable acceleration for most mass ejections. A modest yet credible acceleration was detected in 136 cases, while a deceleration was detected in only 7 cases. The LASCO coronagraph will have a more extensive field of view than the SMM instrument; hence, with these new SOHO (Solar and Heliospheric Observatory) observations, some of the challenging questions concerning mass ejection dynamics can be addressed. How far away from the Sun does the material in a mass ejection continue being accelerated? At what radial distance is the motion of the mass ejection dominated by deceleration as it interacts with the ambient interplanetary material? ESA

N93-31369*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

SUNGRAZING COMET OBSERVATIONS ASSOCIATED WITH SOHO

O. Chris St.Cyr and R. D. Chapman *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 127-128 (For primary document

see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The possibilities of SOHO (Solar and Heliospheric Observatory) related observations of sungrazing comets are discussed. Cometary science was previously identified as a secondary goal of two SOHO instruments (LASCO (Large Angle Spectroscopic Coronagraph) and SWAN (Solar Wind Anisotropy)), and it is believed that valuable contributions to this field may be possible by these and other SOHO instruments. It is demonstrated that observations of sungrazing comets should represent only infrequent intrusions to the basic science goals of the SOHO instruments. In fact, the primary contribution of SOHO instruments may be the discovery of sungrazing (and other) comets during nominal Sun pointed operations, and the subsequent rapid notification of ground based observers concerning these targets of opportunity. ESA

N93-31370# Observatorium fuer Solare Radioastronomie, Tremsdorf (German D.R.). Astrophysikalisches Inst. Postdam.
PRELIMINARY OBSERVATIONS OF SOLAR TYPE 2 BURSTS WITH THE NEW RADIOSPECTROGRAPH IN TREMSDORF (GERMANY)
Gottfried Mann, Henry Aurass, W. Voigt, and J. Paschke *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 129-132 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A radiospectrograph to observe the radioemission of the Sun in the range between 40 up to 800 MHz is described. In contrast to previous radiospectrographs, it consists of three different components: 4 sweep spectrographs, a grid of 14 single frequency polarimeters, and a multichannel spectrograph. Therefore, the instrument is able to observe the solar radio radiation with a very high spectral and temporal resolution up to a height of 2 solar radii and, thus, to provide important ground based observations to the SOHO (Solar and Heliospheric Observatory) mission. Observations of solar type 2 radio bursts by this instrument are presented with the aim of discussing some problems of the physical nature of coronal shock waves. ESA

N93-31371# Academy of Sciences (USSR), Troitsk. Solar Activity Lab.
ECLIPSE OBSERVATIONS OF THE OUTER SOLAR CORONA AND THE SOHO MISSION
Rudolf A. Gulyaev *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 133-136 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The concept of the 'flat solar corona' is pursued. The point is that during the greater part of the sunspot cycle, the solar corona in the three dimensional space is generally as flat as in the solar minimum. Diversity of coronal forms is mainly due to changing orientation of the corona towards the observer. The most interesting is a situation when the flat corona is steeply inclined against the solar equator. With such a tilt, the corona can be at times oriented almost normally to the line of sight, that is, it can lie close to the plane of the sky. Such an orientation yields a good opportunity to observe the corona from the magnetic pole side. This is equivalent to observations of the heliospheric current sheet 'from above'. The possibilities of using the above situations for detailed optical studies of the outer solar corona are discussed in the context of the SOHO (Solar and Heliospheric Observatory) mission. ESA

N93-31372# Slovak Academy of Sciences, Tatranska Lomnica (Czechoslovakia). Inst. of Astronomy.
THE SOLAR CORONA STRUCTURES AS INFERRED FROM JULY 11, 1991 TOTAL SOLAR ECLIPSE OBSERVATION
Julius Sykora and O. G. Badalyan (Academy of Sciences, USSR, Troitsk.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 137-139 Sponsored in part by Mencak (J.) and Son Co. and National Geographic Society (For primary document see N93-31343 12-92)
(Grants SAS-494; SAS-59; CAS-30301)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

During the 11 Jul. 1991 total solar eclipse (La Paz, Mexico), very complete photographic records of the linearly polarized light of the solar corona in continuum and in spectral line FeXIV 530.3 nm were obtained. Degree of polarization is considerably different for both the mentioned spectral regions. This follows, of course, most of all from a difference of the physical substance of polarization both in continuum and in emission spectral lines. The distinct variety of the white light degree of polarization according to the type of coronal structures is discussed. For example, the high degree of polarization is characteristic for the coronal streamers which in case of this eclipse were localized at unusually high solar latitudes. Position of the streamers is certainly reflected in an exceptional position of the heliospheric current sheet and, except of that, seriously casts doubts on the general validity of the Ludendorff's definition of the solar corona flattening. ESA

N93-31373# Observatoire de Paris-Meudon (France).
OBSERVATION OF A CORONAL STREAMER AT METER AND DECIMETER WAVELENGTHS
P. Lantos and C. E. Alissandrakis (Athens Univ., Greece.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 141-143 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Maps obtained at meter and decimeter wavelengths with the Nancay radioheliograph on 24/25 Oct. 1987 are presented. One of the meter wavelength emission sources is located above a chromospheric magnetic field neutral line and a small H alpha prominence. The source has decimeter wavelength counterparts on both sides of the neutral line. The decimeter sources are close to regions of enhanced large scale photospheric magnetic field, while the meter wavelength source is located in between. This suggests emissions at different altitudes in a loop system straddling the neutral line. The region corresponds to a Fe XIV coronal streamer seen during the eastern limb passage. The distance between the footpoints is of the order of 370,000 km and the angle between the loops and the neutral line is about 50 deg, projected on a synoptic chart. ESA

N93-31374# Maryland Univ., College Park. Dept. of Astronomy.
MODELS OF CORONAL STREAMERS AT METER-DECAMETER WAVELENGTHS
Edward J. Schmahl, Natchimuthkonar Gopalswamy, and Mukul R. Kundu *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 145-148 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Throughout the quiet Sun years 1982-1987, the Clark Lake radioheliograph routinely mapped the solar corona on a daily basis at frequencies from 30 to 100 MHz. The Clark Lake maps show a variety of features which were analyzed quantitatively. Among the features are coronal streamers, which appear to cross the solar disk during a solar rotation. The streamers were modeled with various geometries and ray tracing images were computed for comparison with the CLRO (Clark Lake Radio Observatory) maps. The best fitting streamer models have a density profile approximately equal to 5 times Saito (1970) with a background approximately equal to 0.1 times Saito. The required low background value may be explained by either scattering in 'microstructure' or unresolved 'macrostructure'. ESA

N93-31375# Sternberg Astronomical Inst., Moscow (USSR).
ON THE FABRY-PEROT INVESTIGATIONS OF THE SOLAR CORONA: ECLIPSE OBSERVATIONS OF THE GREEN LINE INTENSITIES AND HALF WIDTHS
Iraida S. Kim *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 149-152 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Eclipse data on intensity and half width of the green coronal line

obtained using a Fabry-Perot Interferometer (FPI) combined with a blocking Interference Filter (IF) are presented. Demerits of an FPI (necessity of preliminary monochromatization, ghost images, white corona contribution) are discussed. To get reliable data, blocking filters with FWHM of 2 A and 8 A should be used for the red and green lines, respectively. Requirements for transmission at far wings are extremely strict. According to the eclipse interferograms of the solar corona of 1972 and 1981, the green line intensity varies versus distance as 10(exp -5 to 15). On the average, different coronal structures can be characterized by different values of half width: streamers 0.82 A, helmets 0.88 A, and holes 1.00 A. ESA

N93-31376# Oslo Univ. (Norway). Inst. of Theoretical Astrophysics.
CDS AND SUMER OBSERVATIONS OF FINE STRUCTURE AND DYNAMICS OF LOOPS: EXPERIENCE FROM HRTS
Olav Kjeldseth-Moe *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 155-165 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A03/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

From observations with the High Resolution Telescope and Spectrograph (HRTS), it appears likely that the transition region in the solar atmosphere is characterized by an extreme fine structure, much smaller than one inch in size. The evidence from HRTS and other UV spectrometers for such small structure is discussed, and their structural and dynamical properties are outlined. The appropriate CDS (Coronal Diagnostic Spectrometer) and SUMER (Solar Ultraviolet Measurement of Emitted Radiation) observations needed to extend the knowledge of a finely structured transition region and corona are discussed. ESA

N93-31377*# Stanford Univ., CA. Space Science and Astrophysics Center.
STATIC AND DYNAMIC LOOP MODELS AND THEIR OBSERVATIONAL SIGNATURES
James A. Klimchuk *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 167-176 (For primary document see N93-31343 12-92)
(Contracts NAS8-37334; NAGw-2265; F49620-92-J-0015)
Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The magnetically closed regions of the outer solar atmosphere can be studied in terms of one dimensional hydrodynamic loops models. These regions include the bright plasma loops that are readily visible in EUV and X-ray images as well as the fainter, more diffuse-appearing plasma that surrounds them. The basic theoretical properties of static, steady state, and time dependent loop models are discussed, and these properties are related to observations of emission measure distributions and Doppler shifts. Both existing observations and future observations from the Solar and Heliospheric Observatory (SOHO) are considered. In particular, the dependence of the models on the form of the energy input (coronal heating) is emphasized. ESA

N93-31378# Florence Univ. (Italy). Dept. of Astronomy and Space Science.
THE PROMINENCE-CORONA INTERFACE: MODELS AND OBSERVATIONS
F. Chiuderi Drago *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 177-183 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The Prominence Corona Interface (PCI) is discussed in the assumption that either: the threadlike structure observed in H alpha is due to density waves in an almost isothermal plasma and therefore, the PCI is present only around the bulk of the filament: the threadline structure is due to real cool threads imbedded in the hot coronal plasma and therefore, a PCI is present around each thread. In the latter case, the magnetic field is assumed parallel to the threads and the observed Differential Emission Measure (DEM) is very well reproduced by the assumption that the radiated energy is balanced by ohmic dissipation of Alfven waves at temperature T less than T(sub m) and by the divergence of the conductive flux at T greater than T(sub m), where T(sub m) is temperature of the minimum of DEM. ESA

N93-31379# National Solar Observatory, Sunspot, NM.
MORPHOLOGY OF CORONAL LOOP INTERACTIONS
Raymond N. Smartt and Zhenda Zhang (Nanjing Univ., China.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 185-188 Sponsored in part by NSF (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Localized transient brightenings appear occasionally in images of most flare coronal loop systems, as recorded in the 5303A (Fe XIV) and 6374A (Fe X) lines. Such brightenings occur apparently also in quiet coronal loop systems, but only in the lower range of energies that characterize these events. Brightenings result when two loops come into contact at some point, the enhancement typically extending partially along the loops away from the point of intersection. The observations show systematically that a brightness maximum in the cooler (6374A) line lags that of the hotter (5303A) line by about 9 minutes on average, while H alpha material appears about 9 minutes later, the sequence revealing cooling of the plasma following initial heating. Since an enhancement does not appear in the red line prior to a corresponding maximum occurring in the green line, it appears that the plasma is heated rapidly during initial coalescence. Hence, on this basis it is inferred that such events should be observable in higher temperature lines prior to a maximum appearing in the green line. H alpha material is seen to stream down to the surface from the site of interaction, but there is some evidence also of material moving up from the surface to the region of interaction. The typical morphology of these events is discussed. ESA

N93-31380*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
ACTIVE REGION STUDIES WITH COORDINATED SOHO, MICROWAVE, AND MAGNETOGRAPH OBSERVATIONS
Gordon D. Holman *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 189-191 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The scientific justification for an observing campaign to study the quantitative magnetic and plasma properties of coronal loops in active regions is presented. The SOHO (Solar and Heliospheric Observatory) instruments of primary relevance are CDS (Coronal Diagnostic Spectrometer), EIT, SUMER (Solar Ultraviolet Measurement of Emitted Radiation), and MDI. The primary ground based instruments would be the VLA (Very Large Array), the Owens Valley Radio Observatory, and vector and longitudinal field magnetographs. Similar campaigns have successfully been carried out with the Solar Maximum Mission x-ray polychromator and the Soft X-ray Imaging Sounding Rocket Payload (CoMStOC '87), the Goddard Solar EUV Rocket Telescope and Spectrograph, the Lockheed Solar Plasma Diagnostics Experiment rocket payload, and the Soft X-ray Telescope in Yohkoh (CoMStoc '92). The scientific payoff from such a campaign is discussed in light of the results from these previous campaigns. ESA

N93-31381# Saint Andrew's Univ. (Scotland). Dept. of Mathematical and Computational Sciences.
THERMAL PROFILES OF CORONAL LOOPS: GRAVITATIONAL CONSIDERATIONS
Colin D. C. Steele and E. R. Priest *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 193-196 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Equations of thermal equilibrium along coronal magnetic loops are solved in the absence and presence of gravity. Without gravity, four categories of loop are found: hot, cool, hot-cool, and warm. Which categories exist depends on two parameters involving the heating, the loop length and the

footpoint pressure. Including gravity, the longer hot loops suffer a decrease in their summit temperatures. The hot-cool loops are restricted to a very small range of lengths. A hot-cool arcade can still exist if either the coronal heating or the loop footpoint pressure varies. When the cross sectional area does not vary from footpoint to summit, hot-cool loops may exist only for unrealistically low gravity. However, causing the cross sectional area to vary may allow hot-cool loops to exist for realistic gravity. ESA

N93-31382# Paris XI Univ., Orsay (France). Inst. d'Astrophysique Spatiale.

QUIET AND ACTIVE SOLAR STRUCTURES AS OBSERVED AT THE BOTTOM OF THE TRANSITION REGION

K. Bocchialini and Jean-Claude Vial *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 197-200 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A set of high resolution profiles of H Lyman alpha and beta, Mg II h and k, Ca II H and K lines measured simultaneously above different solar structures, is presented. The large data base provides a way of correlating different parameters in the different lines: L alpha reversal versus intensity, L alpha versus Ca K, and so on. It is noticed that Mg II and Ca II have a similar behavior, different from L alpha and beta ones. Two classifications derived from the distribution of intensities, from which average (cell, network, plage, sunspot) profiles are computed for the 6 lines, are discussed. The Ca results are compared with the two dimensional models of Solanki et al. ESA

N93-31383*# Hulburt (E. O.) Center for Space Research, Washington, DC.

THE PHYSICS OF SOLAR PROMINENCES

Spiro K. Antiochos *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 201-204 Sponsored by NASA, Washington and ONR (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The outstanding questions on the formation of quiescent prominences are discussed. One key issue is identified to be the formation of dips in coronal magnetic field lines. A model is presented which can account for such dipped field lines. The critical ingredients of the model are that the prominence magnetic field is a truly three dimensional structure with significant variation along the prominence length, and the magnetic field has strong shear concentrated at the photospheric neutral line. Simulations which demonstrate that these two features lead to dip formation and that the geometry of the dips are such that inverse polarity prominences can be explained are presented. Another key issue is identified to be the formation of prominence condensations on dipped field lines. It is argued that a spatially varying coronal heating rate which is maximum near the chromosphere explain these condensations. ESA

N93-31384# Ceskoslovenska Akademie Ved, Ondrejov. Inst. of Astronomy.

MASS MOTION OF A HEATED PLASMA BLOB IN A CORONAL LOOP

M. Karlicky and George M. Simnett (Birmingham Univ., England.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 205-208 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A problem of the gravitational fall of dense plasma blob in the semicircular coronal magnetic loop is studied using a one dimensional hydrodynamic code. Considering the thermal conduction and radiative losses are fully compensated by a appropriate heating, it is shown that the falling dense plasma blob compresses the underlying coronal plasma and thus, the blob is decelerated and reflected. This process together with a decompression in the opposite side of coronal loop leads to the oscillation movement of dense plasma blob and eventually to the stop of this blob in some equilibrium position, in which the blob is supported by the pressure of an underlying plasma. This process is very sensitive to the deviation from full compensation of heating, radiative and thermal conduction losses. Nevertheless, it seems that the pressure with the appropriate heating can support the dense and cold plasma, for example in solar prominences, where their magnetic field is stabilizing the Rayleigh-Taylor instability of heavy gas above the lighter one. ESA

N93-31385# Academy of Sciences (USSR), Moscow. Dept. of General Physics and Astronomy.

A NUMERICAL MODEL OF INTERACTION OF CORONAL TRANSIENTS WITH THE SOLAR WIND

Tatiana V. Stepanova and A. G. Kosovichev (Cambridge Univ., England.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 209-212 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Loss of hydrostatic equilibrium of a coronal magnetic loop as a result of an increase of the magnetic field under the loop and as a result of a flare induced heating of plasma inside the loop is considered. The expanding magnetic loops act as a piston in coronal plasma and produce shock waves propagating in the solar wind. The shock waves are computed in a one dimensional, two fluid approximation, taking into account the processes of turbulent dissipation. Two regimes of the process are described: almost monotonic expansion of a magnetic loop with a strong shock ahead of it, when magnetic forces are dominant; oscillatory expansion of a loop with multiple shocks in the ambient plasma, if a magnetic forces can be balanced by the gravity force when there is a significant mass input into the loop. ESA

N93-31386# Peking Univ. (China). Dept. of Geophysics.

WHAT CAN WE LEARN FROM THE SHAPE OF LOOPS?

Jiu-Heng Cheng *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 213-215 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A qualitative result from the transverse momentum differential equation is presented and some general properties of coronal loops are obtained from an integral related to the loop shade. Assuming that flows inside coronal loops are stationary and that the external atmosphere is plane-stratified in hydrostatic equilibrium, then the shape of loops is determined by the physical parameters of the fluids inside and outside the loops. As an inverse problem, some information about physical conditions in loops and the external atmosphere can be derived from the loop shapes. ESA

N93-31387*# Maryland Univ., College Park. Dept. of Astronomy.

3D RECONSTRUCTION METHODS OF CORONAL STRUCTURES BY RADIO OBSERVATIONS

Markus J. Aschwanden, T. S. Bastian (National Radio Astronomy Observatory, Socorro, NM.), and Stephen M. White *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 217-220 Sponsored in part by NSF (For primary document see N93-31343 12-92)

(Grant NAGw-3080)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The ability to carry out the three dimensional (3D) reconstruction of structures in the solar corona would represent a major advance in the study of the physical properties in active regions and in flares. Methods which allow a geometric reconstruction of quasistationary coronal structures (for example active region loops) or dynamic structures (for example flaring loops) are described: stereoscopy of multi-day imaging observations by the VLA (Very Large Array); tomography of optically thin emission (in radio or soft x-rays); multifrequency band imaging by the VLA; and tracing of magnetic field lines by propagating electron beams. ESA

N93-31388*# Lockheed Aircraft Corp., Palo Alto, CA.

OBSERVATIONS OF THE QUIET SUN FROM THE SOFT X RAY TELESCOPE ON YOHKOH

Keith T. Strong *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind

Composition Nov. 1992 p 221-224 Prepared in cooperation with Tokyo Univ., Japan; Tokyo Astronomical Observatory, Mtaka, Japan; Solar Physics Research Corp., Tucson, AZ; Hawaii Univ., Honolulu; California Univ., Berkeley; and Stanford Univ., CA (For primary document see N93-31343 12-92)
(Contract NAS8-37334)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The Soft X-ray Telescope (SXT) on Yohkoh has obtained many thousands of images suitable for studying the quiet Sun. It will give a new perspective on the types of structures, their frequency of occurrence, and their lifetimes that will provide an invaluable tool for planning SOHO (Solar and Heliospheric Observatory) observations of the solar corona. The range of corona phenomena and the dynamic nature of the quiet Sun are illustrated. ESA

N93-31389# Paris XI Univ., Orsay (France). Inst. d'Astrophysique Spatiale.
RADIATIVE MODELING OF SOLAR PROMINENCES, TWO-DIMENSIONAL TRANSFER PLUS PARTIAL FREQUENCY REDISTRIBUTION
F. Paletou, Jean-Claude Vial, and L. H. Auer (Los Alamos National Lab., NM.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 225-228 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The two dimensional (2D) PRD (Partial Redistribution) radiative transfer code of Auer and Paletou was used to compute the resonance lines of HI, MgII and CaII in quiescent prominences, which are modeled as isothermal freestanding slabs illuminated from the sides as well as from below. PRD and 2D effects are evidenced and compared to Complete Redistribution (CRD) computations for both 1D and 2D geometries. Important edge variations are found at the bottom and the top that should be observed with a spatial resolution of one arcsecond. As in 1D, PRD effects allow for greater penetration of the incident radiation into the layer. The 2D code computes both the radial emergent intensity and the amount of radiation backscattered into the chromosphere. It can accordingly, be used to estimate the visibility of filaments. It will be of special interest to build nonisothermal models and compare, for example the Ly alpha profiles with the SUMER/SOHO (Solar Ultraviolet Measurement of Emitted Radiation)/(Solar and Heliospheric Observatory) observations. ESA

N93-31390*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
OBSERVATIONS OF THE SOLAR CORONA WITH A HIGH RESOLUTION EUV IMAGING SPECTROGRAPH
Werner M. Neupert, G. L. Epstein, R. J. Thomas, and W. T. Thompson (Applied Research Corp., Greenbelt, MD.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 229-232 (For primary document see N93-31343 12-92)
(RTOP 879-11-38)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

An extreme ultraviolet imaging spectrograph was used to obtain coronal observations with high spectral and spatial resolution. The imaging properties of the instrument enable measurements of spectral line shapes and positions in discrete spatial elements of a region, so that the dynamic characteristics of the coronal plasma, as well as the distribution of emission measure with temperature and well known density diagnostics, can be studied for specific features. The instrumentation is described and several results of a sounding rocket flight on 5 May 1989, when the corona over NOAA Region 5464 including emission over the umbra of the region's largest sunspot and the pre-impulsive phase emission of a small flare was recorded, are summarized. ESA

N93-31391*# California Univ., Irvine.
DYNAMIC FORMATION AND MAGNETIC SUPPORT OF LOOP OR ARCADE PROMINENCES
Gerard vanHoven, Y. Mok, and J. F. Drake (Maryland Univ., College Park.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 233-236 Sponsored in part by NASA, Washington; NSF; and DOE (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The results of model dynamic simulations of the formation and support of a narrow prominence at the apex of a coronal magnetic loop or arcade are described. The condensation process proceeds via an initial radiative cooling and pressure drop, and a secondary siphon flow from the dense chromospheric ends. The antibuoyancy effect as the prominence forms causes a bending of a confining magnetic field, which propagates toward the semirigid ends of the magnetic loop. Thus, a wide magnetic 'hammock' or well (of a normal polarity Kippenhahn-Schlueter type) is formed, which supports the prominence at or near the field apex. ESA

N93-31392# Ceskoslovenska Akademie Ved, Ondrejov. Inst. of Astronomy.
PULSE-BEAM HEATING IN FLARE LOOPS
Petr Heinzel and M. Karlicky *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 237-240 Sponsored by NAS-NRC (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Using a one dimensional hybrid code, a response of the flare loop atmosphere to a series of very short electron beam pulses with subsecond duration is evaluated. Loop dynamics and energy balance are treated by solving the standard set of hydrodynamic equations, while the beam deceleration in denser atmospheric layers is evaluated by using a particle simulation technique. Ionization of hydrogen below T approximately equal to 10,000K is obtained by solving simultaneously the time dependent non LTE problem for a three level hydrogen atom with continuum. The resulting electron densities are then used to compute radiation losses at each time step. The behavior of time dependent heating, the ionization structure of the chromosphere, and the role of relaxation processes are discussed. A series of short duration electron beam pulses represents schematically the nonstationary heating in the flare loops. However, the time dependent radiation hydrodynamical approach used can also be applied to study other processes taking place in coronal loops. ESA

N93-31393# Naval Research Lab., Washington, DC. Beam Physics Branch.
TEMPERATURE DEPENDENT MORPHOLOGY OF UNTWISTED CORONAL LOOPS
David Alan Garren, James Chen, and Peter J. Cargill (Science Applications International Corp., McLean, VA.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 241-244 Sponsored by ONR (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The morphology of slender coronal loops with an untwisted magnetic field is investigated. The specific shape of a loop is delineated through application of equations determining the local minor radius and loop curvature along its length. These equations follow from magnetohydrodynamic force balance across the minor radial cross section of the loop. The dependence of the loop shape on the ratio of the internal to ambient pressures at the loop apex and the ratio of the temperature is studied. It is found that loops with an apex pressure lower than that of the ambient plasma exhibit smaller apex radius of curvature with increasing loop temperature, and the opposite applies to loops with plasma pressure at the apex lower than that of the ambient plasma. The possibilities of quantitative comparison with the future SOHO (Solar and Heliospheric Observatory) data are discussed. ESA

N93-31394# Naval Research Lab., Washington, DC. Beam Physics Branch.
A COMPARISON OF THE DYNAMICAL SIGNATURES OF CORONAL HEATING MECHANISMS
Peter J. Cargill (Science Applications International Corp., McLean, VA.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 245-248 Sponsored by ONR (For primary document see N93-31343

12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A potential way of distinguishing between different coronal heating mechanisms is by either broadening or Doppler shifts in spectra lines. Parameterizations of coronal heating models in terms of their dynamical signature are developed and it is shown that each of reconnection (or nanoflares), field aligned current dissipation, and Alfven waves have different signal to limb variations. If coronal heating proceeds by a sequence of small energy releases, predictions are made of the resolution needed to distinguish such a mechanisms from Alfen wave heating. SOHO (Solar and Heliospheric Observatory) can provide great advances in such an analysis, and the applications of its results to SUMER (Solar Ultraviolet Measurement of Emitted Radiation) and CDS (Coronal Diagnostic Spectrometer). ESA

N93-31395# Science Applications International Corp., McLean, VA.
EVOLUTION AND OSCILLATIONS OF CORONAL LOOPS
Peter J. Cargill, James Chen (Naval Research Lab., Washington, DC.), and David Alan Garren (Naval Research Lab., Washington, DC.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 249-252 Sponsored by ONR (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The equations of motion for the global temporal evolution of a curved loop with a twisted magnetic field are presented. Such loops are shown to be linearly unstable when the ratio of their height to footpoint separation is too small, and will tend to rise in the corona to form a more complete part of the arc of a circle. It is shown that the oscillation periods of these loops differ significantly from that determined by simple standing Alfven waves. This emphasizes the importance of using realistic loop models when determining coronal magnetic fields from coronal oscillation data. When such a curved loop undergoes an injection of azimuthal flux, it rises in the corona and oscillates about a new equilibrium. The possible detection of these properties using instruments on SOHO (Solar and Heliospheric Observatory) is discussed. ESA

N93-31396# FOM-Inst. voor Plasmafysica, Rijnhuizen, Jutphaas (Netherlands).
CORONAL HEATING: THE ROLE OF RESONANT ABSORPTION
Stefaan Poedts and J. P. Goedbloed *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 253-256 (For primary document see N93-31343 12-92)
(Grant SC1-0255-C)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The efficiency and time scales of Alfven wave heating of solar coronal loops is investigated by means of numerical simulations in the framework of both linear and nonlinear dissipative magnetohydrodynamics. The coronal loops are modeled by cylindrical plasma columns that are excited by waves that are incident in them. Parameter studies are presented of the efficiency of the coupling of the external source to the coronal loop plasma, the fraction of the power supplied by the external source that is actually absorbed and converted into heat, the quality of the resonances that occur, the basic time scales of the resonant absorption mechanism, and the temporal evolution of the energetics of the driven dissipative system. The results of these investigations indicate that resonant absorption is a viable heating mechanism for solar coronal loops. ESA

N93-31397*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
UNDERNEATH CORONAL LOOPS: MSDP OBSERVATIONS COORDINATED WITH SERTS 4 AND NIXT FLIGHTS
B. Schmieder (Observatoire de Paris-Meudon, France.), N. Mein (Observatoire de Paris-Meudon, France.), L. Golub (Harvard-Smithsonian Center for Astrophysics, Cambridge, MA.), J. M. Davila, J. Brosius (Hughes STX, Inc., Lanham, MD.), and R. Thomas *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 257-260 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Ground based coordinated observations with the Multichannel Subtractive Double Mass spectrograph (MSDP) allowed the chromospheric intensity and velocity fields below coronal structures during recent launchs of sounding rockets to be portrayed. During SERTS 4 observations (7 May 1991), two different active regions (AR 6615, AR 6608) presenting flare and filament were coaligned with UV structures. On 11 Jul. 1991 (eclipse day) large H alpha ejection material in AR 6713 (N38 W 42) was detected during the NIXT (Normal Incidence X-ray Telescope) flight. Preliminary results are displayed. ESA

N93-31398# Glasgow Univ. (Scotland). Dept. of Physics and Astronomy.
BAYESIAN ANALYSIS OF SOHO SPECTRA
David Alexander *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 261-264 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The analysis of spectroscopic data obtained by the CDS (Coronal Diagnosis Spectrometer) and SUMER (Solar Ultraviolet Measurement of Emitted Radiation) instruments to be flown on board the SOHO (Solar and Heliospheric Observatory) satellite is addressed. A Bayesian statistical approach, rather than the more usual chi squared testing, is employed and it is argued that this may lead to a better determination of the line profile parameters used as diagnostics for the physical characteristics of the emitting plasma. It is shown that for the simple case of Gaussian line profiles, the results obtained from the Bayesian analysis are essentially identical to the chi squared results, thereby demonstrating its viability. The advantages of the Bayesian method over the chi squared approach, however, make it a more useful tool for the analysis of spectroscopic data. One of the main advantages discussed is the possibility of obtaining probability distributions for individual parameters of interest rather than joint distributions in parameter space. ESA

N93-31399# Birmingham Univ. (England). School of Physics and Space Research.
MULTI-THERMAL EMISSION ASSOCIATED WITH A LIMB PROMINENCE FOLLOWING TWO SUBFLARES AND A CORONAL MASS EJECTION
George M. Simnett *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 265-268 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Observations of a limb prominence which became activated following two small x-ray flares on 13 Aug. 1980 are presented. For the second event the structure was clearly visible in soft x-rays for over 30 minutes. The prominence was also emitting strongly at other wavelengths, and in particular the UV O V emission was seen from what appeared to be precisely the same structure as the x-rays. The brightest point in both the UV and x-rays appeared first at the opposite end of the prominence to the chromospheric flare. The highest temperature plasma was in excess of 10(exp 7) K. The energization of the prominence is discussed and it is suggested that energy deposition by energetic particles could be important. It is further suggested that the particles are accelerated by reconnecting coronal magnetic fields associated with a coronal mass ejection which was in progress throughout this period. ESA

N93-31400# Saint Andrew's Univ. (Scotland).
THE MAGNETOTHERMAL STABILITY OF RADIALLY STRATIFIED LINE-TIED CORONAL LOOPS
Ronald A. M. VanderLinden and M. Goossens (Katholieke Univ. te Leuven, Belgium.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 269-272 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The influence of the photospheric anchoring of the magnetic field lines

(line tying) in the magnetic and thermal (or 'magnetothermal') stability of radially stratified coronal loops is studied. The anchoring of the magnetic field lines in the photosphere is modeled by line tying boundary conditions. Using a simple force free equilibrium, it is shown that line tying has a much stronger influence on a magnetic instability than on a thermal instability. Thus, line tying can lead to loops that are magnetically stable but thermally unstable. In such loops, condensations can form due to a thermal instability. This may be of relevance in the context of the formation and eruption of prominences in the solar corona. ESA

N93-31401# Saint Andrew's Univ. (Scotland). Dept. of Mathematical and Computational Sciences.

FAST COMPUTATION OF MAGNETOHYDROSTATIC EQUILIBRIA USING EULER POTENTIALS AND MULTIGRID METHODS

Russ A. S. Fiedler *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 273-275 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The increase in computing power in recent years has made the calculation of nonlinear coronal magnetic fields feasible. The main techniques used in the calculation of 2.5D (two and half dimensional) and three dimensional configurations were based upon finite difference relaxation procedures which are relatively straightforward and are well suited for cases where only low resolution is required. The convergence properties of these methods degrade rapidly with increased resolution thus making large scale, high resolution simulations unattractive. A Full Approximation Storage (FAS) multigrid strategy which overcomes these convergence difficulties is presented. The effectiveness of the strategy is demonstrated for a variety of 2D and 3D magnetic configurations which are relevant to modeling of the solar corona. ESA

N93-31402*# Harvard-Smithsonian Center for Astrophysics, Cambridge, MA.

TEMPERATURE MEASUREMENTS IN THE INNER CORONA

Ruth Esser, S. R. Habbal, and M. B. Arndt *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 277-280 (For primary document see N93-31343 12-92)

(Grants NAGw-249; AF-AFOSR-0244-91; NAVF-438.92/002)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

To increase the understanding of the acceleration of the solar wind, it is necessary to combine observations and theoretical approaches. The importance of coordinated measurements in the inner corona and interplanetary space to place constraints on solar wind models is demonstrated. Given the fact that the temperature in the inner corona is the most important parameter in solar wind modeling, observations from which reliable temperatures can be deduced are crucial for such coordinated approaches. The derivation of temperatures in the inner corona are addressed, as well as which assumptions and models are inherent in the temperatures derived using different observational techniques. Two examples of extreme ultraviolet (EUV) observations are chosen to demonstrate problems that can arise in the interpretation of measurements. ESA

N93-31403# Naval Research Lab., Washington, DC.

OBSERVATIONAL TESTS OF CORONAL HEATING MODELS

Katrina Waljeski, Ken P. Dere (Hulburt, E. O. Center for Space Research, Washington, DC.), and Dan Moses (Hulburt, E. O. Center for Space Research, Washington, DC.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 281-284 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The properties of coronal loops are measured and used to test the predictions of coronal heating models. The coronal loop temperature, emission measure, geometry, and magnetic field strength are measured from broadband soft x-ray images obtained by the High Resolution Soft X-ray Imaging Sounding Rocket payload and from coordinated ground based observations. The radiative energy loss rates for these loops, calculated from the observed plasma properties, are compared to the scalings with loop length or magnetic field strength predicted by various models of coronal heating. The loop scaling laws of Rosner, Tucker, and Vaiana, and of Golub et al are also tested with these observations. ESA

N93-31404# Observatoire de Midi-Pyresnees, Toulouse (France).

GENERAL PROPERTIES OF THE POLARIZATION OF THE Fe 14 5303 A CORONAL EMISSION LINE

Jean Arnaud *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 285-288 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The intensity and linear polarization of coronal emission lines such as the Fe XIII 10747 A and the Fe XIV 5303 A lines contain information on coronal electron density and magnetic field direction. Several average properties of the Fe XIV 5303 A line from measurements performed using the Pic du Midi (France) monochromatic coronameter are summarized. The mean direction of the polarization is found to be radial while the average polarization rate is consistent with models taking into account the depolarization produced by density inhomogeneities and actual fluctuations in magnetic field direction. The observed large scale organization of the polarization clearly reveals the existence of the large scale structure of the coronal magnetic field. ESA

N93-31405*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

MICROFLARES OBSERVED WITH UVSP AND HXIS

Jason G. Porter *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 289-292 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A review of an analysis of SMM (Solar Maximum Mission) microflare observations is presented. The data, from the UVSP (Ultraviolet Spectrometer and Polarimeter) and HXIS (Hard X-ray Imaging Spectrometer) instruments, show that there are counterparts to UV microflares in x-ray emission characteristic of 10(exp 7) K plasma. Implications of the x-ray/UV relationship for flare distribution functions and coronal heating are discussed, and examples of similar events in SMM quiet Sun data are shown. ESA

N93-31406# Turin Univ. (Italy). Ist. di Fisica Generale.

A DIAGNOSTIC METHOD FOR RECONNECTING MAGNETIC FIELDS IN THE SOLAR CORONA

Ester Antonucci and Boris V. Somov (Moscow State Univ., Russia.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 293-294 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

One of the distinctive features of reconnecting magnetic fields in a current sheet in the solar corona is the presence of plasma outflows, whose velocity depends on the plasma temperature inside the current sheet itself. The outflowing plasma is characterized by a symmetric velocity distribution along the line of sight. Therefore the ultimate observational effect of magnetic reconnection is a nonthermal broadening in the emission spectral lines. If reconnection occurs in a pre-flare active region, an observable nonthermal broadening in the XUV lines formed at a few million degrees is expected. The nonthermal profile of the individual spectral lines observed with SOHO (Solar and Heliospheric Observatory) can be computed as a function of the temperature inside the current sheet. ESA

N93-31407# Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.

ABUNDANCE DETERMINATION IN THE QUIET CORONA

Helen E. Mason *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 297-304 Sponsored in part by Science Research Council (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A study of the determination of element abundances in the quiet regions of the solar transition zone and corona is made. Early work with EUV spectral lines is reviewed together with subsequent analyses of Skylab observations. The intention of this study is to question some of the assumptions which have been made in these analyses and to look critically at the accuracy of past and present atomic data. The overall aim is to assess what further work is required to adapt these methods for use as diagnostic techniques with the SOHO (Solar and Heliospheric Observatory) instruments, in particular CDS (Coronal Diagnostic Spectrometer) and SUMER (Solar Ultraviolet Measurement of Emitted Radiation). Mention is also made of the importance of studying the coronal forbidden lines in the visible and infrared wavelength regions. ESA

N93-31408# Liege Univ. (Belgium). Inst. d'Astrophysique.
PHOTOSPHERIC ABUNDANCES
Nicolas Grevesse, A. Noels, and A. J. Sauval (Belgian Royal Observatory, Brussels.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 305-308 Sponsored in part by Belgian National Fund for Scientific Research (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The photospheric abundances of the chemical elements which are observed in the coronal spectrum, in the solar wind and in solar energetic particle events, are reviewed. Elements which can be measured in the solar upper layers and whose abundances were revised since Anders and Grevess are discussed: helium, neon argon, iron, carbon nitrogen oxygen, fluorine chlorine, scandium titanium. ESA

N93-31409# Bern Univ. (Switzerland). Physikalisches Inst.
SOLAR WIND ABUNDANCES FROM ULYSSES
R. vonSteiger *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 309-314 Sponsored by Swiss National Foundation for Scientific Research (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The SWICS (Solar Wind Ion Composition Spectrometer) instrument on board the Ulysses spacecraft is a true mass (not mass per charge) spectrometer, flown for the first time in the solar wind. The sensor's working principles and capabilities are reviewed, and the different data types obtained and how they are routinely analyzed are discussed. Distribution functions of 9 minor ion charge states are presented and compared for two periods with very low and high solar wind kinetic temperature. Daily averages of solar wind abundance ratios of C/O and Mg/O from switch-on in late 1990 up to mid 1992, that is, mainly during Ulysses' journey to Jupiter, near the ecliptic plane, are presented. The composition data is discussed in the framework of the FIP (First Ionization Potential) fractionation effect. ESA

N93-31410*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
ENERGETIC PARTICLE OBSERVATIONS AND THE ABUNDANCES OF ELEMENTS IN THE SOLAR CORONA
Donald V. Reames *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 315-323 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

During the last few years it has become clear that energetic particles in the largest solar events, where abundances are commonly measured, are not accelerated in flares Rather they are accelerated from the ambient plasma above active regicns by shock waves driven by coronal mass ejections. The lowest energy particles from these events have abundances that almost directly reflect those of the source plasma. Residual effects of acceleration, that depend smoothly on the ion's corona Q/A, vanish when abundances are averaged over many events, yielding the characteristic dependence of the average coronal abundances of the First Ionization Potential (FIP) of the elements from H through Fe. In contrast, energetic ions accelerated out of the high speed solar wind from large coronal holes show a reduced FIP effect with a different pattern. ESA

N93-31411# Observatoire de Paris-Meudon (France).
FIRST IONIZATION POTENTIAL FRACTIONATION
J. C. Henoux and B. V. Somov (Sternberg Astronomical Inst., Moscow, USSR.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 325-330 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The existing models of FIP (First Ionization Potential) fractionation are reviewed. The main characteristics of the observed abundance anomalies that must be taken into account by FIP fractionation models are recalled. Two main models, based on ion neutral separation in a magnetic field and which differ fundamentally by the nature of the particles (neutrals or ions) that cross the lines of force under the constraint of pressure or electric forces, are presented. A qualitative model of FIP fractionation based on a quantitative estimate of the characteristics of DC currents generated into magnetic flux tubes and of their mechanical effects is addressed. As discussed in the conclusion, FIP fractionation appears as a natural consequence of the circulation of currents in magnetic flux tubes and it can be associated with the formation of the solar chromosphere. ESA

N93-31412# Finnish Meteorological Inst., Helsinki.
INTERPLANETARY HYDROGEN GAS AS A MONITOR OF THE SUN'S CORPUSCULAR AND RADIATIVE OUTPUT
T. Summanen, Erkki Kyrola, Rosine Lallement (Centre National de la Recherche Scientifique, Verrieres-Le Buisson, France.), and Jean-Loud Bertaux (Centre National de la Recherche Scientifique, Verrieres-Le Buisson, France.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 331-334 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Four Prognoz-6 Lyman alpha intensity measuring sessions right after the solar minimum were used to study the latitudinal change of the solar ionization rate at 1 AU. The measurements were performed during two and a half months in 1977. The model results, based on the so called thermal model for the interstellar wind and the optically thin model for the scattering process, were compared with the intensity measurements. This comparison resulted in the model for the solar ionization rate at 1 AU. The ionization rates differ from a session to another, but there are two similar characteristics in each session. The common features are the enhanced ionization rate near the heliographic equatorial plane and the broad plateaus of the constant rate around +/- 30 to +/- 70 deg. ESA

N93-31413# Alabama Univ., Huntsville.
EFFECTS OF HYDROGEN AND ELECTRON DIFFUSION ON TRACE SPECIES DIFFUSION IN THE SOLAR ATMOSPHERE
Juan M. Fontenla and E. H. Avrett (Harvard-Smithsonian Center for Astrophysics, Cambridge, MA.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 335-338 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The effects of the diffusion of neutral hydrogen, protons, and electrons, on the diffusion of heavy species in the lower transition region are studied. This layer has large temperature and hydrogen ionization gradients as the temperature changes from 10,000 to 100,000K. Hydrogen diffusion induces an abundance gradient opposed to the hydrogen ionization gradient. Thermal diffusion counteracts this effect for ionized particles. The low FIP (First Ionization Potential) species (fully ionized in the lower transition region) experience both effects. The high FIP species (neutral at T = 10,000K) are practically affected by only the hydrogen diffusion effect. The result is the enhancement of the abundance of the low FIP elements with respect to the high FIP elements at the top of our models. However, the rate at which this process occurs is critical and large departures from the equilibrium abundances are expected because of the slow relaxation rates at the top of the chromosphere. ESA

N93-31414# Academy of Sciences (USSR), Moscow. Space Research Inst.

SOLAR WIND HEAVY IONS AND PROTON/ALPHA PARTICLE RELATIONS OBSERVED ONBOARD THE PROGNOZ 7 SATELLITE

Yuri I. Yermolaev *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 339-342 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Prognoz 7 results dealing with investigation of medium scale (from hours to days) variations of heavy ions in the low and middle speed solar wind streams on the basis of ion energy spectrum measurements and flow parameters of protons and alpha particles using the systematic selective measurements are summarized. The variations in the abundances and charge states of various ions observed continuously during several two to three day intervals are used to evaluate the variability of helical composition and electron temperature in the solar corona. Particularly, it is shown that several dependences of average abundance of heavy ions He, O, Si and Fe relative to protons and ones relative to oxygen are different at the same conditions. The heavy ion abundance depends on types of solar wind streams which may be connected with solar corona structure and phenomena. ESA

N93-31415# Turku Univ. (Finland). Space Research Lab.

A DOUBLE-PEAKED SOLAR FLARE: CONCLUSIONS ON PARTICLE TRANSPORT

Jarmo Torsti and C. G. Schultz *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 343-346 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The large solar event of 29 Sep. 1989 at 11:33 UT was analyzed. Data was available from the GOES 6 and 7 satellites and from some 26 neutron monitors worldwide. Of the latter, the ground level enhancement measured by 7 stations was given an in depth analysis. Conclusions on the energy spectra and acceleration time are given, based on a double diffusive transport model containing a one dimensional interplanetary transport along the field line, and a two dimensional transport, tentatively called coronal. A special feature of this event is a clear double peak structure, with the ratio of the second peak amplitude to the first dropping from as much as 2 down to 1 when the rigidity increases from 100 to 500 MV, and being a few tens of percent in the GV rigidity region. Comparing different energies, the identical starting time of the fluxes forces the conclusion that the acceleration of the 100 MV particles has started several tens of minutes before the production of the first relativistic particles. ESA

N93-31416*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

CORONAL ABUNDANCES IN SOLAR ACTIVE REGIONS MEASURED BY THE SOLAR MAXIMUM MISSION FLAT CRYSTAL SPECTROMETER

Julia L. R. Saba and Keith T. Strong (Lockheed Aircraft Corp., Palo Alto, CA.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 347-350 (For primary document see N93-31343 12-92)

(Contract NAS5-30431)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

High resolution soft X-ray spectra acquired by the Flat Crystal Spectrometer (FCS) on solar Maximum Mission provide an excellent data base to study the relative abundances of O, Ne, Mg, and Fe in solar active regions. The FCS data show significant variability for all combinations of these elements. The largest variation occurs for Fe:Ne, which shows region to region changes of up to a factor of 7, and frequent factor of 2 variations in day to day samples of a given region. The atomic data and the ionization balance calculations used to interpret the line ratios affect the actual abundance values obtained, but have little effect on the magnitude of the total range of variation inferred. Resonance scattering of Fe XVII could cause a systematic offset in the abundances determined, but cannot be responsbile for the bulk of the observed variability. While abundance variability complicates the derivation of plasma parameters from spectroscopic measurements, it should offer exciting new clues to the processes which form and heat the corona. ESA

N93-31417# Belgian Royal Observatory, Brussels.

THE JULY 11, 1991 SOLAR CORONA OBSERVED IN POLARIZED WHITE LIGHT: PRELIMINARY RESULTS

Frederic Clette and J.-R. Gabryl (Liege Univ., Belgium.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 351-353 (For primary document see N93-31343 12-92)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

During the July 91 total solar eclipse, the polarized K corona was observed from two sites in Baja California (Mexico) using two techniques: photography with a 6 position polarizing filter (30 deg steps) and CCD (Charge Coupled Device) camera using 12 positions (15 deg steps). A total of 36 CCD images were combined to produce intensity and polarization maps of the corona from 1.1 to 3.0 solar radii with 10 inch spatial resolution. Several characteristics of the corona can already be deduced from those data, which are now processed to compute the global electron density distribution. ESA

N93-31418# Polish Academy of Sciences, Wroclaw. Space Research Center.

OBJECTIVES OF RESIK SOLAR CONCAVE SOFT X RAY SPECTROMETER FOR CORONAS-F MISSION

Janusz Sylwester and R. D. Bentley (Mullard Space Science Lab., Dorking, England.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 357-359 (For primary document see N93-31343 12-92)

(Grants PCSR-2-2150-90-03p/24; SERC-GR-G-10517)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Several institutes are involved in construction of the high sensitivity soft X-ray spectrometer RESIK, to be flown aboard the Russian Coronas-F satellite in 1994/95. The scientific objectives of the instrument are discussed, arising as a compromise between the scientific interests and constrained by good quality large area crystals obtainable, detector dimensions and the geometry of Bragg concave crystal reflection. Four bands were selected to perform measurements of the solar active region and flare spectra: 2.97 to 3.24 A, 3.15 to 3.25 A, 4.95 to 5.15 A, and 6.50 to 7.19 A. Special 'Dopplerometer' arrangement of the crystals will allow the assignment of 'absolute' wavelength scale and will determine the role of directed and turbulent flows in the source. Interpretation of the line and continuum intensities will derive the differential emission measure for plasma temperature T greater than 3 MK, and will detemine the composition (relative to H) of the coronal plasma for many elements including these with different first ionization potential. ESA

N93-31419*# Tufts Univ., Medford, MA.

VERY LARGE ARRAY (VLA) OBSERVATIONS OF CORONAL LOOPS

Kenneth R. Lang *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 361-365 (For primary document see N93-31343 12-92)

(Grant NAGw-2383)

Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Advances in ground based Very Large Array (VLA) observations of the Sun, and how they complement and extend EUV and X-ray observations from space are reviewed. The VLA provides high resolution, full disk images that include hot, dense coronal loops within individual active regions (at 20 cm), and cooler, higher, more extended structures (at 90 cm) that can connect widely separated active regions, describe high lying noise storms, or act as a transition sheath between cool dark filaments and the hot enveloping corona. VLA images of both cool and hot corona loops can be compared with data from most of the SOHO (Solar and Heliospheric Observatory) instruments, thereby enhancing the scientific return of the SOHO mission beyond that expected from using its instruments alone. ESA

N93-31420# Observatoire de Midi-Pyresnees, Toulouse (France).
CORONAGRAPHIC GROUND BASED SUPPORT FOR SOHO AT THE PIC-DU-MIDI OBSERVATORY (FRANCE)
Alain Buecher and Jacques-Clair Noens *In* ESA, Proceedings on the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 367-370 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Two coronagraphs were prepared at the Pic-du-Midi observatory (France) for a ground based support for the SOHO (Solar and Heliospheric Observatory) mission. The Multichannel Spectro Coronagraph (MSCO) produces maps of the intensities of emission lines in the corona or prominences and reflex images of the same observed region with a restricted field in the light defined by interference filters and optics channels. This instrument may be used during the SOHO mission principally as a support for programs concerning the coronal cavities. The H Alpha Coronagraph (HACO) performs a survey of the cool material evolutions all around the solar limb up to one solar radius. This instrument was at first developed as a support for the SOHO mission principally for the study of coronal events and large scale material transport. ESA

N93-31421# National Oceanic and Atmospheric Administration, Boulder, CO. Space Environment Lab.
AUTOMATIC RECOGNITION OF SOLAR FEATURES
Pat L. Bornmann *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 371-374 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

Initial algorithms were developed to recognize two very different types of features in solar images: H alpha filaments and large scale magnetic field patterns. These algorithms provide an effective way to evaluate possibilities for future routine, automated image analysis of large numbers of solar images. ESA

N93-31422*# Harvard-Smithsonian Center for Astrophysics, Cambridge, MA.
MEASURING ELECTRON TEMPERATURE IN THE EXTENDED CORONA
Donald M. Hassler, L. D. Gardner, and John L. Kohl *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 375-380 (For primary document see N93-31343 12-92)
(Contract NAS5-31250; NAG5-613)
Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

A technique for measuring electron temperature in the extended corona from the line profile of the electron scattered component of coronal H I Ly alpha produced by Thomson scattering of chromospheric Ly alpha emission is discussed. Because of the high thermal velocity of electrons at coronal temperatures (approximately 6800 km/s at T(sub e) = 1,500,000 K) the effect of nonthermal velocities and solar wind flows on the electron velocity distribution are negligible. However, the low electron mass which is responsible for the high thermal velocity also results in a very wide profile (approximately equal to 50 A). This wide profile, together with an intensity that is three orders of magnitude weaker than the resonantly scattered component of Ly alpha makes the direct measurement of T(sub e) a challenging observational problem. An evaluation of this technique based on simulated measurements is presented and the subsequent instrumental requirements necessary to make a meaningful determination of the electron temperature are discussed. Estimates of uncertainties in the measured electron temperature are related to critical instrument parameters such as grating stray light suppression. ESA

N93-31423# Bern Univ. (Switzerland). Physikalisches Inst.
INTERACTION OF SOLAR WIND IONS WITH THIN CARBON FOILS: CALIBRATION OF TIME-OF-FLIGHT SPECTROMETERS
M. Gonin, Alfred Buergi, M. Oetliker, and P. Bochsler *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 381-384 Sponsored in part by Swiss National Science Foundation (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

With the KAFKA (German acronym for carbon foils collisions analyzer) experiment, charge exchange, energy loss and angular scattering of solar wind ions in thin (1 to 10 microg/sq cm) carbon foils, are studied. Such foils are extensively used in time of flight mass spectrometry. So far, the properties of H, He, B, C, N, O, F, Ne, Na, Mg, Al, Si, S, Cl, Ar, K, Ti, Fe, and Ni and in the 0.5 to 5 keV/u energy range have been investigated. ESA

N93-31424*# National Aeronautics and Space Administration, Washington, DC.
DESIGN FOR A COMPLETE SOHO MISSION UNDER THE ISTP
W. J. Wagner and David H. Burks (Science Applications International Corp., Washington, DC.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 387-392 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A02/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The Solar and Heliospheric Observatory (SOHO) occupies a crucial slot in the International Solar Terrestrial Physics (ISTP) program, which investigates the energy and material flows in key regions of the geospace. Prior space missions which have brought understanding of the corona to what it is today are reviewed. Similarly, space science programs on the horizon will build on SOHO discoveries and insights. SOHO program structure and cost control methods are sketched; tasks have been transferred off the spacecraft where possible, and capabilities will be delivered just before needed. The team analyses of data will be augmented by a SOHO guest investigator program after launch. Theorists on teams would similarly be joined by participants in a proposed SOHO theory program. The ISTP program is built on a foundation of collaborative science, implying the need for observational campaigns directed from a user friendly operations center. ESA

N93-31425# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Space Science Dept.
SOME EUROPEAN ACTIVITIES IN SUPPORT OF THE SOHO MISSION
Martin C. E. Huber and Vicente Domingo *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 393-395 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The rationale and potential functions of the European Science Data and Operations Centre (ESDOC) are outlined. Currently, three competitive proposals for the provision of such a center are being prepared. In line with the European funding system (where investigations to be flown on SOHO are being paid for by national sources), ESDOC will be funded by the ESA member state providing it. Other efforts, namely the gathering of support through the Joint Organization for Solar Observations (JOSO) for ground based observations in the context of the SOHO (Solar and Heliospheric Observatory) mission, as well as the development of a vacuum ultraviolet transfer source standard to be used for radiometrically intercomparing spectrometric SOHO instruments, are described. ESA

N93-31426# Rutherford Appleton Lab., Chilton (England). Astrophysics Div.
THE SOHO INTERDISCIPLINARY SCIENCE MATRIX
Richard A. Harrison and G. Schultz (Turku Univ., Finland.) *In* ESA, Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition Nov. 1992 p 397-400 (For primary document see N93-31343 12-92)
Copyright Avail: CASI HC A01/MF A04; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

To pursue the goals of SOHO (Solar and Heliospheric Observatory), it is required to compare and analyze data sets from very different experiments. Such interdisciplinary studies require careful planning, prior to the observations, and involve complex analysis procedures. In recognition of

this, the SOHO Coronal and Particle Working Group has initiated a study to provide an overview of the nature of such activities. The first results of this study are presented. ESA

N93-31436# National Geophysical Data Center, Boulder, CO.
SOLAR-GEOPHYSICAL DATA NUMBER 583, MARCH 1993. PART 1: (PROMPT REPORTS). DATA FOR FEBRUARY, JANUARY 1993, AND LATE DATA
H. E. Coffey Mar. 1993 156 p See also PB93-188902 and PB93-174035
(PB93-188894; SGD-583-Pt-1) Avail: CASI HC A08/MF A02
Contents: Data for February 1993; Solar-Terrestrial Environment; IUWDS Alert Periods (Advanced and Worldwide); Solar Activity Indices; Solar Flares; Solar Radio Emission; Standford Mean Solar Magnetic Field; Data for January 1993; Solar Active Regions; Sudden Ionospheric Disturbances; Solar Radio Spectral Observations; Cosmic Ray Measurements by Neutron Monitor; Geomagnetic Indices. NTIS

N93-31437# National Geophysical Data Center, Boulder, CO.
SOLAR-GEOPHYSICAL DATA NUMBER 583, MARCH 1993. PART 2: (COMPREHENSIVE REPORTS). DATA FOR SEPTEMBER 1992 AND MISCELLANEOUS
H. E. Coffey Mar. 1993 71 p See also PB93-188894 and PB93-174043
(PB93-188902; SGD-583-Pt-2) Avail: CASI HC A04/MF A01
Contents: Data for September 1992; Solar Flares; Solar Radio Bursts at Fixed Frequencies; Solar X-ray Radiation from GOES Satellite Graphs; Mass Ejections from the Sun; Active Prominences and Filaments. NTIS

N93-31676# Saint Andrew's Univ. (Scotland). Dept. of Mathematical Sciences.
SOLAR CORONAL MAGNETIC STRUCTURE
E. R. Priest *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 13-19 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A03/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31677# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (Germany). Inst. fuer Extraterrestrische Physik.
MOMENTUM TRANSPORT THROUGH THE CHROMOSPHERE
Gerhard Haerendel *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 23-29 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31678# Hungarian Academy of Sciences, Budapest. Research Inst. for Particle and Nuclear Physics.
THE STRUCTURE OF THE DAYSIDE BOUNDARY LAYER BETWEEN THE VENUS IONOSPHERE AND THE SHOCKED SOLAR WIND
K. Szego, Z. Dobe, W. C. Knudsen (Knudsen Geophysical Branch, Monte Sereno, CA.), A. F. Nagy (Michigan Univ., Ann Arbor.), V. D. Shapiro (California Univ., La Jolla.), and V. I. Shevchenko (California Univ., La Jolla.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 31-36 (For primary document see N93-31674 12-90)
(Grants US-HUN-35/90; OTKA-1813)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31679# Utrecht State Univ. (Netherlands). Sterrenkundig Inst.
RETARDATION EFFECTS AND THE ORIGIN OF FILAMENT OSCILLATIONS
M. Kuperus and G. H. J. vandenOord *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 39-41 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31681*# Southwest Research Inst., San Antonio, TX.
CORONAL SHOCK WAVES
Richard S. Steinolfson *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 51-57 (For primary document see N93-31674 12-90)
(Grants NAGw-2087; NAGw-2779)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31685# National Oceanic and Atmospheric Administration, Boulder, CO. Space Environment Lab.
HELIOSPHERIC CURRENT SHEET EFFECTS ON THE PROPAGATION OF SOLAR-GENERATED SHOCK WAVES
M. Dryer, S. T. Wu (Alabama Univ., Huntsville.), C. C. Wu (Alabama Univ., Huntsville.), and S. M. Han (Tennessee Technological Univ., Cookeville.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 77-79 (For primary document see N93-31674 12-90)
(Contract NOAA/SEL-50RANR000104)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31686# Kiel Univ. (Germany). Inst. fuer Reine und Angewandte Kernphysik.
INFLUENCE OF INTERPLANETARY SHOCKS ON APPROXIMATELY 10 MeV PROTONS: A PHENOMENOLOGICAL CLASSIFICATION
May-Britt Kallenrode and G. Wibberenz *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 81-86 (For primary document see N93-31674 12-90)
(Contract DFG-Wi259/8)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31695# Sussex Univ., Brighton (England). Astronomy Centre.
RECONNECTION IN THE SOLAR CORONA
M. Jardine *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 141-149 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31701# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (Germany).
ON THE SOLAR WIND-MAGNETOSPHERE-IONOSPHERE COUPLING: AMPTE/CCE PARTICLE DATA AND THE AE INDICES
I. A. Daglis, E. T. Sarris (Thrace Univ., Xanthe, Greece.), G. Kremser (Oulu Univ., Finland.), and B. Wilken *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 193-198 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31702# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (Germany).
ORIGIN OF THE SOLAR WIND AND CORONAL MASS EJECTIONS
Rainer Schwenn *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 205-206 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31703# Rutherford High Energy Lab., Chilton (England).
DETECTING AND TRACKING CHANGES IN SOLAR WIND CONDITIONS USING INTERPLANETARY SCINTILLATION
Richard A. Harrison, M. A. Hapgood, and D. G. Sime (National Center for Atmospheric Research, Boulder, CO.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 207-209 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31704# Oslo Univ. (Norway). Inst. of Theoretical Astrophysics.
MULTIPLE FLOWS IN THE SOLAR TRANSITION REGION
P. Brekke, N. Brynildsen, O. Kjeldseth-Moe, P. Maltby, and G. E. Brueckner (Naval Research Lab., Washington, DC.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 211-216 Sponsored by Norwegian Research Council for Science and the Humanities (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31705# Academy of Sciences (USSR), Moscow. Space Research Inst.
MASS, MOMENTUM AND ENERGY TRANSPORT FROM THE SUN TO THE EARTH BY DIFFERENT TYPES OF THE SOLAR WIND: PROGNOZ 7 OBSERVATIONS
Y. I. Yermolaev *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 217-222 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31706# Rutherford High Energy Lab., Chilton (England). Space Science Div.
SOLAR WIND PENETRATION TO GEOSTATIONARY ALTITUDE DURING THE MARCH 1991 MAGNETIC STORM
M. Grande, C. H. Perry, J. B. Blake (Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau, Germany.), J. F. Fennell (Aerospace Corp., Los Angeles, CA.), B. Wilken (Aerospace Corp., Los Angeles, CA.), and S. Livi *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 223-228 (For primary document see N93-31674 12-90)
(Contract F04701-88-C-0089; AF-AFOSR-85-0237)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31708# Sheffield Univ. (England).
THE IMPLEMENTATION OF THE DIGITAL WAVE PROCESSOR FOR THE ESA/NASA CLUSTER MISSION
L. J. C. Woolliscroft, H. S. C. Alleyne, C. Dunford, A. Sumner, J. A. Thompson, and K. H. Yearby *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 243-248 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31716# Rutherford High Energy Lab., Chilton (England).
CORONAL MASS EJECTA AND FLARES: A STATISTICAL STUDY
R. A. Harrison and D. G. Sime (National Center for Atmospheric Research, Boulder, CO.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 289-293 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31718# Main Astronomical Observatory, Kiev (Ukraine).
ON THE BERNSTEIN MODES GENERATION IN SOLAR POST-FLARE LOOPS
A. N. Kryshtal *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 301-306 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31720# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (Germany).
SPECTRA AND STRUCTURE FUNCTIONS OF TEMPERATURE FLUCTUATIONS IN THE INNER SOLAR WIND
Eckart Marsch, S. Liu, C.-Y. Tu (Beijing Univ., China.), and H. Rosenbauer *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 315-320 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31721# Alcala de Henares Univ., Madrid (Spain). Dept. de Fisica.
CALIBRATION OF A DETECTOR SYSTEM FOR SOLAR ENERGETIC PARTICLES ANALYSIS
Jose Medina, L. delPeral, S. Sanchez, and D. Meziat *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 321-325 (For primary document see N93-31674 12-90)
(Grant CICYT-ESP88-0306-C02-02)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31723*# Alabama Univ., Huntsville. Center for Space Plasma and Aeronomic Research.
THREE-DIMENSIONAL NUMERICAL SIMULATION OF INTERPLANETARY MAGNETIC FIELD CHANGES AT 1 AU AS A CONSEQUENCE OF SIMULATED SOLAR FLARES
S. T. Wu, Chin-Chun Wu, and Murray Dryer (National Oceanic and Atmospheric Administration, Boulder, CO.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 333-336 (For primary document see N93-31674 12-90)
(Contract NAGw-9; NOAA-50RANR000104)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31724# Main Astronomical Observatory, Kiev (Ukraine).
NONLINEAR INTERACTION OF ALFVEN WAVES IN SOLAR ATMOSPHERE
A. K. Yukhimuk, N. Y. Kotsarenko (Kiev State Univ., USSR.), and V. A. Yukhimuk (Kiev State Univ., USSR.) *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 337-341 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31725*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CELIAS: CHARGE, ELEMENT AND ISOTOPE ANALYSIS SYSTEM FOR THE SOHO MISSION
D. Hovestadt (Max-Planck-Inst. fuer Physik und Astrophysik, Garching, Germany.), J. Geiss (Bern Univ., Switzerland.), G. Gloeckler (Maryland Univ., College Park.), W. I. Axford (Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau, Germany.), H. Balsinger (Bern Univ., Switzerland.), P. Bochsler (Bern Univ., Switzerland.), A. Buergi (Max-Planck-Inst. fuer Physik und Astrophysik, Garching, Germany.), R. Canfield (National Inst. of Standards and Technology, Gaithersburg, MD.), M. Coplan (Maryland Univ., College Park.), and H. Dinse (Technische Univ., Brunswick, Germany.) et al *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 343
Prepared in cooperation with Arizona Univ., Tucso n, New Hampshire Univ., Durham, Academy of Sciences (USSR), Moscow, Univ. of Southern California, Los Angeles, Physikalisch-Technische Bundesanstalt, Berlin, Germany, and NIST, Gaithersburg, MD (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A01/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31726# Ben Gurion Univ. of the Negev, Beersheva (Israel). Dept. of Physics.
POSSIBLE MANIFESTATION OF THE CRITICAL IONIZATION VELOCITY PHENOMENON IN THE SOLAR CORONA
E. I. Golbraikh and M. A. Filippov *In* ESA, Study of the Solar-Terrestrial System Sep. 1992 p 345-350 (For primary document see N93-31674 12-90)
Copyright Avail: CASI HC A02/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

N93-31775# Sterrenwacht Sonnenborgh, Utrecht (Netherlands).
HIGH RESOLUTION SOLAR PHYSICS
Robert J. Rutten *In* ESA, Targets for Space-Based Interferometry Dec. 1992 p 163-173 (For primary document see N93-31750 12-89)
Copyright Avail: CASI HC A03/MF A03; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N93-32222*# Iowa Univ., Iowa City.
ANALYSIS OF URANIAN RADIO EMISSIONS, URANUS DATA ANALYSIS PROGRAM (UDAP) Final Report, 15 Aug. 1987 - 30 Sep. 1991

W. Calvert 21 Nov. 1991 4 p
(Grant NAGw-1206)
(NASA-CR-193524; NAS 1.26:193524) Avail: CASI HC A01/MF A01

Progress under this grant has included identifying certain new radio emission components and determining the source location of both these and the two major Uranian radio emission (the SHF and bursty components) by a unique new statistical minimization technique. This new source location technique has subsequently also been applied at Neptune, with considerable success. New radio spectrograms have been prepared to clarify the behavior of such emissions, using both the usual 48-second, log-averaged data and the original 6-second PRA data, the latter showing a number of interesting new features. Also, a plasmasphere was discovered at Uranus, auroral plasma cavities were discovered at both Uranus and Neptune, and it was found that the currently-accepted rotation period for Uranus is in error by a small amount. Author

99 GENERAL

N93-31590# Tel-Aviv Univ. (Israel). Interdisciplinary Center for Technological Analysis and Forecasting.
THE ISRAEL SPACE AGENCY 1993
Abraham Tal 31 May 1993 53 p Original contains color illustrations
Avail: CASI HC A04/MF A01

A brochure describing the Israel Space Agency (ISA), its policy, and activities in research and industry is presented. A brief description of the agency and its structure is provided. Academic space-related activities and space-related industrial capabilities are described. CASI

N93-31734# Groupement des Industries Francaises Aeronautiques et Spatiales, Paris (France).
FRENCH AEROSPACE EQUIPMENT [EQUIPMENTS AEROSPATIAUX FRANCAIS]
1993 566 p In ENGLISH and FRENCH
Avail: CASI HC A24/MF A04

The 190 member firms of GIFAS (Association of French Aeronautical and Space Industries) represent the three major branches of the profession: airframes, power plants, and systems and equipment. These firms develop, produce, maintain, and provide product support for all their equipment. The basic aims of GIFAS are (1) coordination of industrial and commercial activities of members; (2) evaluation and defense of their interests, whether moral, economic, industrial, or commercial; and (3) promoting the profession in France and in other countries. Company technical data sheets are included. CASI

N93-32097*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
THE SIXTH ANNUAL WORKSHOP ON SPACE OPERATIONS APPLICATIONS AND RESEARCH (SOAR 1992)
Kumar Krishen, ed. Feb. 1993 538 p Workshop held in Houston, TX, 4-6 Aug. 1992
(NASA-CP-3187-Vol-1; S-706; NAS 1.55:3187-Vol-1) Avail: CASI HC A23/MF A04

This document contains papers presented at the Space Operations, Applications, and Research Symposium (SOAR) hosted by the U.S. Air Force (USAF) on 4-6 Aug. 1992 and held at the JSC Gilruth Recreation Center. The symposium was cosponsored by the Air Force Material Command and by NASA/JSC. Key technical areas covered during the symposium were robotic and telepresence, automation and intelligent systems, human factors, life sciences, and space maintenance and servicing. The SOAR differed from most other conferences in that it was concerned with Government-sponsored research and development relevant to aerospace operations. The symposium's proceedings include papers covering various disciplines presented by experts from NASA, the USAF, universities, and industry. For individual titles, see N93-32098 through N93-32158.

N93-32098*# Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Electrical and Computer Engineering.
AN ICONIC PROGRAMMING LANGUAGE FOR SENSOR-BASED ROBOTS **c61**
Matthew Gertz, David B. Stewart, and Pradeep K. Khosla *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 1-8 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

In this paper we describe an iconic programming language called Onika for sensor-based robotic systems. Onika is both modular and reconfigurable and can be used with any system architecture and real-time operating system. Onika is also a multi-level programming environment wherein tasks are built by connecting a series of icons which, in turn, can be defined in terms of other icons at the lower levels. Expert users are also allowed to use control block form to define servo tasks. The icons in Onika are both shape and color coded, like the pieces of a jigsaw puzzle, thus providing a form of error control in the development of high level applications. Author (revised)

N93-32099*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REMOTE SURFACE INSPECTION SYSTEM **c38**
S. Hayati, J. Balaram, H. Seraji, W. S. Kim, K. Tso (SoHaR, Inc., Los Angeles, CA.), and V. Prasad (California Inst. of Tech., Pasadena.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 9-27 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

This paper reports on an on-going research and development effort in remote surface inspection of space platforms such as the Space Station Freedom (SSF). It describes the space environment and identifies the types of damage for which to search. This paper provides an overview of the Remote Surface Inspection System that was developed to conduct proof-of-concept demonstrations and to perform experiments in a laboratory environment. Specifically, the paper describes three technology areas: (1) manipulator control for sensor placement; (2) automated non-contact inspection to detect and classify flaws; and (3) an operator interface to command the system interactively and receive raw or processed sensor data. Initial findings for the automated and human visual inspection tests are reported. Author (revised)

N93-32100*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SUPERVISORY AUTONOMOUS LOCAL-REMOTE CONTROL SYSTEM DESIGN: NEAR-TERM AND FAR-TERM APPLICATIONS **c63**
Wayne Zimmerman and Paul Backes *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 28-40 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

The JPL Supervisory Telerobotics Laboratory (STELER) has developed a unique local-remote robot control architecture which enables management of intermittent bus latencies and communication delays such as those expected for ground-remote operation of Space Station robotic systems via the TDRSS communication platform. At the local site, the operator updates the work site world model using stereo video feedback and a model overlay/fitting algorithm which outputs the location and orientation of the object in free space. That information is relayed to the robot User Macro Interface (UMI) to enable programming of the robot control macros. The operator can then employ either manual teleoperation, shared control, or supervised autonomous control to manipulate the object under any degree of time-delay. The remote site performs the closed loop force/torque control, task monitoring, and reflex action. This paper describes the STELER local-remote robot control system, and further describes the near-term planned Space Station applications, along with potential far-term applications such as telescience, autonomous docking, and Lunar/Mars rovers. Author

N93-32101*# Rensselaer Polytechnic Inst., Troy, NY.
PERFORMANCE ANALYSIS OF A ROBOTIC SYSTEM FOR SPACE-BASED ASSEMBLY Abstract only **c63**
Alan Desrochers and Hauke Jungnitz *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 41 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

A dual arm system for space-based assembly has been under development and experimentation at the Center of Intelligent Robotic

Systems for Space Exploration. This paper will describe the components of this system and will then focus on the specific problem of predicting response time of the integrated system. This hierarchical system consists of a task representation and planning level, a coordination level, and an execution level to carry out the desired assembly task. A common modeling methodology based on Petri nets was used to model the various subtasks throughout the levels of the hierarchy. The Petri net model can then be analyzed for liveness and boundedness that, in turn, are used to detect the existence of deadlock or conflict in the system. The model can also be used to calculate the time it will take to complete an assembly task once an operator issues a command. These modeling results are compared with the actual experimental results obtained from carrying out the assembly task. Author (revised)

N93-32102*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

AUTOMATED ASSEMBLY OF LARGE SPACE STRUCTURES USING AN EXPERT SYSTEM EXECUTIVE **c18**

Cheryl L. Allen *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 43-53 (For primary document see N93-32097 12-99)

Avail: CASI HC A03/MF A04

NASA LaRC has developed a unique testbed for investigating the practical problems associated with the assembly of large space structures using robotic manipulators. The testbed is an interdisciplinary effort which considers the full spectrum of assembly problems from the design of mechanisms to the development of software. This paper will describe the automated structures assembly testbed and its operation, detail the expert system executive and its development, and discuss the planned system evolution. Emphasis will be placed on the expert system development of the program executive. The executive program must be capable of directing and reliably performing complex assembly tasks with the flexibility to recover from realistic system errors. By employing an expert system, information pertaining to the operation of the system was encapsulated concisely within a knowledge base. This lead to a substantial reduction in code, increased flexibility, eased software upgrades, and realized a savings in software maintenance costs. Author (revised)

N93-32103*# Stanford Univ., CA. Aerospace Robotics Lab.

STANFORD AEROSPACE RESEARCH LABORATORY RESEARCH OVERVIEW **c18**

W. L. Ballhaus, L. J. Alder, V. W. Chen, W. C. Dickson, and M. A. Ullman *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 54-65 (For primary document see N93-32097 12-99)

Avail: CASI HC A03/MF A04

Over the last ten years, the Stanford Aerospace Robotics Laboratory (ARL) has developed a hardware facility in which a number of space robotics issues have been, and continue to be, addressed. This paper reviews two of the current ARL research areas: navigation and control of free flying space robots, and modelling and control of extremely flexible space structures. The ARL has designed and built several semi-autonomous free-flying robots that perform numerous tasks in a zero-gravity, drag-free, two-dimensional environment. It is envisioned that future generations of these robots will be part of a human-robot team, in which the robots will operate under the task-level commands of astronauts. To make this possible, the ARL has developed a graphical user interface (GUI) with an intuitive object-level motion-direction capability. Using this interface, the ARL has demonstrated autonomous navigation, intercept and capture of moving and spinning objects, object transport, multiple-robot cooperative manipulation, and simple assemblies from both free-flying and fixed bases. The ARL has also built a number of experimental test beds on which the modelling and control of flexible manipulators has been studied. Early ARL experiments in this arena demonstrated for the first time the capability to control the end-point position of both single-link and multi-link flexible manipulators using end-point sensing. Building on these accomplishments, the ARL has been able to control payloads with unknown dynamics at the end of a flexible manipulator, and to achieve high-performance control of a multi-link flexible manipulator. Author (revised)

N93-32104*# Sandia National Labs., Albuquerque, NM. Intelligent Systems and Robotics Center.

THE TECHNOLOGY BASE FOR AGILE MANUFACTURING **c31**

R. C. Brost, D. R. Strip, and P. J. Eicker *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 66-71 Sponsored in part by DOE (For primary document see N93-32097 12-99)

(Contract DE-AC04-76DP-00789)

Avail: CASI HC A02/MF A04

The effective use of information is a critical problem faced by manufacturing organizations that must respond quickly to market changes. As product runs become shorter, rapid and efficient development of product manufacturing facilities becomes crucial to commercial success. Effective information utilization is a key element to successfully meeting these requirements. This paper reviews opportunities for developing technical solutions to information utilization problems within a manufacturing enterprise and outlines a research agenda for solving these problems. Author (revised)

N93-32105*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

SENSOR FUSION FOR ASSURED VISION IN SPACE APPLICATIONS **c74**

Marie-France Collin and Kumar Krishen *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 72-85 (For primary document see N93-32097 12-99)

Avail: CASI HC A03/MF A04

By using emittance and reflectance radiation models, the effects of angle of observation, polarization, and spectral content are analyzed to characterize the geometrical and physical properties--reflectivity, emissivity, orientation, dielectric properties, and roughness--of a sensed surface. Based on this analysis, the use of microwave, infrared, and optical sensing is investigated to assure the perception of surfaces on a typical lunar outpost. Also, the concept of employing several sensors on a lunar outpost is explored. An approach for efficient hardware implementation of the fused sensor systems is discussed. Author (revised)

N93-32106*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

MAN-MACHINE COOPERATION IN ADVANCED TELEOPERATION **c54**

Paolo Fiorini, Hari Das, and Sukhan Lee *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 87-93 (For primary document see N93-32097 12-99)

Avail: CASI HC A02/MF A04

Teleoperation experiments at JPL have shown that advanced features in a telerobotic system are a necessary condition for good results, but that they are not sufficient to assure consistently good performance by the operators. Two or three operators are normally used during training and experiments to maintain the desired performance. An alternative to this multi-operator control station is a man-machine interface embedding computer programs that can perform some of the operator's functions. In this paper we present our first experiments with these concepts, in which we focused on the areas of real-time task monitoring and interactive path planning. In the first case, when performing a known task, the operator has an automatic aid for setting control parameters and camera views. In the second case, an interactive path planner will rank different path alternatives so that the operator will make the correct control decision. The monitoring function has been implemented with a neural network doing the real-time task segmentation. The interactive path planner was implemented for redundant manipulators to specify arm configurations across the desired path and satisfy geometric, task, and performance constraints. Author (revised)

N93-32107*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

INTEGRATION OF ADVANCED TELEOPERATION TECHNOLOGIES FOR CONTROL OF SPACE ROBOTS **c54**

Michael J. Stagnaro *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 94-103 (For primary document see N93-32097 12-99)

Avail: CASI HC A02/MF A04

Teleoperated robots require one or more humans to control actuators,

mechanisms, and other robot equipment given feedback from onboard sensors. To accomplish this task, the human or humans require some form of control station. Desirable features of such a control station include operation by a single human, comfort, and natural human interfaces (visual, audio, motion, tactile, etc.). These interfaces should work to maximize performance of the human/robot system by streamlining the link between human brain and robot equipment. This paper describes development of a control station testbed with the characteristics described above. Initially, this testbed will be used to control two teleoperated robots. Features of the robots include anthropomorphic mechanisms, slaving to the testbed, and delivery of sensory feedback to the testbed. The testbed will make use of technologies such as helmet mounted displays, voice recognition, and exoskeleton masters. It will allow tor integration and testing of emerging telepresence technologies along with techniques for coping with control link time delays. Systems developed from this testbed could be applied to ground control of space based robots. During man-tended operations, the Space Station Freedom may benefit from ground control of IVA or EVA robots with science or maintenance tasks. Planetary exploration may also find advanced teleoperation systems to be very useful. Author (revised)

N93-32108*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INTERACTIVE AND COOPERATIVE SENSING AND CONTROL FOR ADVANCED TELEOPERATION **c54**
Sukhan Lee *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 104-115 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

This paper presents the paradigm of interactive and cooperative sensing and control as a fundamental mechanism of integrating and fusing the strengths of man and machine for advanced teleoperation. The interactive and cooperative sensing and control is considered as an extended and generalized form of traded and shared control. The emphasis of interactive and cooperative sensing and control is given to the distribution of mutually nonexclusive subtasks to man and machine, the interactive invocation of subtasks under the man/machine symbiotic relationship, and the fusion of information and decisionmaking between man and machine according to their confidence measures. The proposed interactive and cooperative sensing and control system is composed of such major functional blocks as the logical sensor system, the sensor-based local autonomy, the virtual environment formation, and the cooperative decision-making between man and machine. The Sensing-Knowledge-Command (SKC) fusion network is proposed as a fundamental architecture for implementing cooperative and interactive sensing and control. Simulation results are shown. Author

N93-32109*# Air Force Systems Command, Wright-Patterson AFB, OH. Armstrong Lab.
AIR FORCE RESEARCH IN HUMAN SENSORY FEEDBACK FOR TELEPRESENCE **c63**
Ronald G. Julian *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 116-120 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

Telepresence operations require high quality information transfer between the human master and the remotely located slave. Present Air Force research focuses on the human aspects of the information needed to complete the control/feedback loop. Work in three key areas of human sensory feedback for manipulation of objects are described. Specific projects in each key area are outlined, including research tools (hardware), planned research, and test results. Nonmanipulative feedback technologies are mentioned to complete the advanced teleoperation discussions.
Author (revised)

N93-32110*# Air Force Civil Engineering Center, Tyndall AFB, FL. Civil Engineering Support Agency.
AIR FORCE CONSTRUCTION AUTOMATION/ROBOTICS **c31**
A. D. Nease and E. F. Alexander *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 121-130 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

The Air Force has several missions which generate unique requirements that are being met through the development of construction robotic technology. One especially important mission will be the conduct of Department of Defense (DOD) space activities. Space operations and other missions place construction/repair equipment operators in dangerous environments and potentially harmful situations. Additionally, force reductions require that human resources be leveraged to the maximum extent possible, and more stringent construction repair requirements push for increased automation. To solve these problems, the U.S. Air Force is undertaking a research and development effort at Tyndall AFB, FL, to develop robotic construction/repair equipment. This development effort involves the following technologies: teleoperation, telerobotics, construction operations (excavation, grading, leveling, tool change), robotic vehicle communications, vehicle navigation, mission/vehicle task control architecture, and associated computing environment. The ultimate goal is the fielding of a robotic repair capability operating at the level of supervised autonomy. This paper will discuss current and planned efforts in space construction/repair, explosive ordnance disposal, hazardous waste cleanup, and fire fighting.
Author (revised)

N93-32111*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SATELLITE TEST ASSISTANT ROBOT (STAR) **c18**
D. A. McAffee, D. J. Kerrisk, and K. R. Johnson *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 131-148 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

A three-year, three-phase program to demonstrate the applicability of telerobotic technology to the testing of satellites and other spacecraft has been initiated. Specifically, the objectives are to design, fabricate, and install into the JPL 25-ft. Space Simulator (SS) a system that will provide the capability to view test articles from all directions in both the visible and infrared (IR) spectral regions, to automatically map the solar flux intensity over the entire work volume of the chamber, and to provide the capability for leak detection. The first year's work, which provides a vertically mobile viewing platform equipped with stereo cameras, will be discussed. Design constraints and system implementation approaches mandated by the requirements of thermal vacuum operation will be emphasized. Author

N93-32112*# Naval Command, Control and Ocean Surveillance Center, Kailua, HI.
TELEOPERATOR/TELEPRESENCE SYSTEM (TOPS) CONCEPT VERIFICATION MODEL (CVM) DEVELOPMENT **c54**
Mike S. Shimamoto *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 149-155 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

The development of an anthropomorphic, undersea manipulator system, the TeleOperator/telePresence System (TOPS) Concept Verification Model (CVM) is described. The TOPS system's design philosophy, which results from NRaD's experience in undersea vehicles and manipulator systems development and operations, is presented. The TOPS design approach, task teams, manipulator, and vision system development and results, conclusions, and recommendations are presented. Author (revised)

N93-32113*# Air Force Civil Engineering Center, Tyndall AFB, FL. Civil Engineering Support Agency.
FIRE PROTECTION FOR LAUNCH FACILITIES USING MACHINE VISION FIRE DETECTION **c15**
Douglas B. Schwartz *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 156-162 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

Fire protection of critical space assets, including launch and fueling facilities and manned flight hardware, demands automatic sensors for continuous monitoring, and in certain high-threat areas, fast-reacting automatic suppression systems. Perhaps the most essential characteristic for these fire detection and suppression systems is high reliability; in other words, fire detectors should alarm only on actual fires and not be falsely activated by extraneous sources. Existing types of fire detectors have

been greatly improved in the past decade; however, fundamental limitations of their method of operation leaves open a significant possibility of false alarms and restricts their usefulness. At the Civil Engineering Laboratory at Tyndall Air Force Base in Florida, a new type of fire detector is under development which 'sees' a fire visually, like a human being, and makes a reliable decision based on known visual characteristics of flames. Hardware prototypes of the Machine Vision (MV) Fire Detection System have undergone live fire tests and demonstrated extremely high accuracy in discriminating actual fires from false alarm sources. In fact, this technology promises to virtually eliminate false activations. This detector could be used to monitor fueling facilities, launch towers, clean rooms, and other high-value and high-risk areas. Applications can extend to space station and in-flight shuttle operations as well; fiber optics and remote camera heads enable the system to see around obstructed areas and crew compartments. The capability of the technology to distinguish fires means that fire detection can be provided even during maintenance operations, such as welding. Author

N93-32114*# Oak Ridge National Lab., TN. Robotics and Process Systems Div.

REMOTE DRIVING WITH REDUCED BANDWIDTH COMMUNICATION **c32**

Frederick W. DePiero, Timothy E. Noell, and Timothy F. Gee *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 163-171 Previously announced as N93-16408 Sponsored in part by USA and DOE (For primary document see N93-32097 12-99)

(Contract DE-AC05-84OR-21400)

Avail: CASI HC A02/MF A04

Oak Ridge National Laboratory has developed a real-time video transmission system for low bandwidth remote operations. The system supports both continuous transmission of video for remote driving and progressive transmission of still images. Inherent in the system design is a spatiotemporal limitation to the effects of channel errors. The average data rate of the system is 64,000 bits/s, a compression of approximately 1000:1 for the black and white National Television Standard Code video. The image quality of the transmissions is maintained at a level that supports teleoperation of a high mobility multipurpose wheeled vehicle at speeds up to 15 mph on a moguled dirt track. Video compression is achieved by using Laplacian image pyramids and a combination of classical techniques. Certain subbands of the image pyramid are transmitted by using interframe differencing with a periodic refresh to aid in bandwidth reduction. Images are also foveated to concentrate image detail in a steerable region. The system supports dynamic video quality adjustments between frame rate, image detail, and foveation rate. A typical configuration for the system used during driving has a frame rate of 4 Hz, a compression per frame of 125:1, and a resulting latency of less than 1s. Author (revised)

N93-32115*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PLANETARY ROVER DEVELOPMENTS AT JPL Abstract only **c37**

Brian Wilcox *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 172 (For primary document see N93-32097 12-99)

Avail: CASI HC A01/MF A04

Planetary rover research has recently focused on small rovers, which are competent to explore and assist in in-situ analysis of limited areas around a landing site (as opposed to the larger, long range rovers, which have been assumed to accompany sample return missions). Navigation and mobility concepts of these small rovers are, in some cases, somewhat different than what was assumed in the past. The sensing, computing, communication, and power resources of these missions dictate a rethinking of the 'large mission' approach. Recent results and demonstrations along this new direction are described. Author (revised)

N93-32116*# Oak Ridge National Lab., TN. Center for Engineering Systems Advanced Research.

REAL-TIME QUALITATIVE REASONING FOR TELEROBOTIC SYSTEMS Abstract only **c37**

Eancois G. Pin *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 173 (For primary document see N93-32097 12-99)

Avail: CASI HC A01/MF A04

This paper discusses the sensor-based telerobotic driving of a car in a-priori unknown environments using 'human-like' reasoning schemes implemented on custom-designed VLSI fuzzy inferencing boards. These boards use the Fuzzy Set theoretic framework to allow very vast (30 kHz) processing of full sets of information that are expressed in qualitative form using membership functions. The sensor-based and fuzzy inferencing system was incorporated on an outdoor test-bed platform to investigate two control modes for driving a car on the basis of very sparse and imprecise range data. In the first mode, the car navigates fully autonomously to a goal specified by the operator, while in the second mode, the system acts as a telerobotic driver's aid providing the driver with linguistic (fuzzy) commands to turn left or right, speed up, slow down, stop, or back up depending on the obstacles perceived by the sensors. Indoor and outdoor experiments with both modes of control are described in which the system uses only three acoustic range (sonar) sensor channels to perceive the environment. Sample results are presented that illustrate the feasibility of developing autonomous navigation modules and robust, safety-enhancing driver's aids for telerobotic systems using the new fuzzy inferencing VLSI hardware and 'human-like' reasoning schemes. Author (revised)

N93-32117*# Sandia National Labs., Albuquerque, NM.

RATLER: ROBOTIC ALL-TERRAIN LUNAR EXPLORATION ROVER **c37**

J. W. Purvis and P. R. Klarer *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 174-179 Previously announced as N93-11502 (For primary document see N93-32097 12-99)

Avail: CASI HC A02/MF A04

A robotic rover vehicle designed for use in the exploration of the Lunar surface is described. The Robotic All-Terrain Lunar Exploration Rover (RATLER) is a four wheeled all-wheel-drive dual-body vehicle. A uniquely simple method of chassis articulation is employed which allows all four wheels to remain in contact with the ground, even while climbing over step-like obstacles as large as 1.3 wheel diameters. Skid steering and modular construction are used to produce a simple, rugged, highly agile mobility chassis with a reduction in the number of parts required when compared to current designs being considered for planetary exploration missions. The design configuration, mobility parameters, and performance of several existing RATLER prototypes are discussed. Author (revised)

N93-32118*# Maryland Univ., College Park. Space Systems Lab.

POTENTIAL ROLES FOR EVA AND TELEROBOTICS IN A UNIFIED WORKSITE Abstract only **c18**

David Akin and Russel D. Howard *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 181 (For primary document see N93-32097 12-99)

Avail: CASI HC A01/MF A04

Although telerobotics and extravehicular activity (EVA) are often portrayed as competitive approaches to space operations, ongoing research in the Space Systems Laboratory (SSL) has demonstrated the utility of cooperative roles in an integrated EVA/telerobotic work site. Working in the neutral buoyancy simulation environment, tests were performed on interactive roles or EVA subjects and telerobots in structural assembly and satellite servicing tasks. In the most elaborate of these tests to date, EVA subjects were assisted by the SSL's Beam Assembly Teleoperator (BAT) in several servicing tasks planned for Hubble Space Telescope, using the high-fidelity crew training article in the NASA Marshall Neutral Buoyancy Simulator. These tests revealed several shortcomings in the design of BAT for satellite servicing and demonstrated the utility of a free-flying or RMS-mounted telerobot for providing EVA crew assistance. This paper documents the past tests, including the use of free-flying telerobots to effect the rescue of a simulated incapacitated EVA subject, and details planned future efforts in this area, including the testing of a new telerobotic system optimized for the satellite servicing role, the development of dedicated telerobotic devices designed specifically for assisting EVA crew, and conceptual approaches to advanced EVA/telerobotic operations such as the Astronaut Operations Vehicle. Author (revised)

N93-32119*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GRAPHICS SIMULATION AND TRAINING AIDS FOR ADVANCED TELEOPERATION **c61**
Won S. Kim, Paul S. Schenker, and Antal K. Bejczy *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 182-189 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

Graphics displays can be of significant aid in accomplishing a teleoperation task throughout all three phases of off-line task analysis and planning, operator training, and online operation. In the first phase, graphics displays provide substantial aid to investigate work cell layout, motion planning with collision detection and with possible redundancy resolution, and planning for camera views. In the second phase, graphics displays can serve as very useful tools for introductory training of operators before training them on actual hardware. In the third phase, graphics displays can be used for previewing planned motions and monitoring actual motions in any desired viewing angle, or, when communication time delay prevails, for providing predictive graphics overlay on the actual camera view of the remote site to show the non-time-delayed consequences of commanded motions in real time. This paper addresses potential space applications of graphics displays in all three operational phases of advanced teleoperation. Possible applications are illustrated with techniques developed and demonstrated in the Advanced Teleoperation Laboratory at JPL. The examples described include task analysis and planning of a simulated Solar Maximum Satellite Repair task, a novel force-reflecting teleoperation simulator for operator training, and preview and predictive displays for on-line operations. Author (revised)

N93-32120*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
POTENTIAL LOW-COST TELEROBOTICS FLIGHT EXPERIMENTS Abstract only **c37**
Brian Wilcox *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 190 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

Few telerobotic devices have flown in space (the remote manipulator system (RMS) on the Space Shuttle is the principal one that has flown), and proposed telerobotic systems have ballooned in cost to the point where the U.S. no longer has any funded flight telerobotic programs. Three possible alternative systems with limited scope, but with significant research and even operational promise are described. These include systems or research in effective control of (possibly flexible) arms in microgravity, despite long communication latency, and for inspection of elements of spacecraft such as Space Station Freedom. Author (revised)

N93-32121*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
JSC FLIGHT EXPERIMENT RECOMMENDATION IN SUPPORT OF SPACE STATION ROBOTIC OPERATIONS **c18**
Reginald B. Berka *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 191-20 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

The man-tended configuration (MTC) of Space Station Freedom (SSF) provides a unique opportunity to move robotic systems from the laboratory into the mainstream space program. Restricted crew access due to the Shuttle's flight rate, as well as constrained on-orbit stay time, reduces the productivity of a facility dependent on astronauts to perform useful work. A natural tendency toward robotics to perform maintenance and routine tasks will be seen in efforts to increase SSF usefulness. This tendency will provide the foothold for deploying space robots. This paper outlines a flight experiment that will capitalize on the investment in robotic technology made by NASA over the past ten years. The flight experiment described herein provides the technology demonstration necessary for taking advantage of the expected opportunity at MTC. As a context to this flight experiment, a broader view of the strategy developed at the JSC is required. The JSC is building toward MTC by developing a ground-based SSF emulation funded jointly by internal funds, NASA/Code R, and NASA/Code M. The purpose of this ground-based Station is to provide a platform whereby technology originally developed at JPL, LaRC, and GSFC can be integrated into a near flight-like condition. For instance, the Automated Robotic Maintenance of Space Station (ARMSS) project integrates flat targets, surface inspection, and other JPL technologies into a Station analogy for evaluation. Also, ARMSS provides the experimental platform for the Capaciflector from GSPC to be evaluated for its usefulness in performing ORU change out or other tasks where proximity detection is required. The use and enhancement of these ground-based SSF models are planned for use through FY-93. The experimental data gathered from tests in these facilities will provide the basis for the technology content of the proposed flight experiment.
Author (revised)

N93-32122*# Air Force Systems Command, Kelly AFB, TX. Robotics and Automation Center of Excellence.
RACE PULLS FOR SHARED CONTROL **c14**
M. B. Leahy, Jr. and B. K. Cassiday *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 205-211 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

Maintaining and supporting an aircraft fleet, in a climate of reduced manpower and financial resources, dictates effective utilization of robotics and automation technologies. To help develop a winning robotics and automation program the Air Force Logistics Command created the Robotics and Automation Center of Excellence (RACE). RACE is a command wide focal point. Race is an organic source of expertise to assist the Air Logistic Center (ALC) product directorates in improving process productivity through the judicious insertion of robotics and automation technologies. RACE is a champion for pulling emerging technologies into the aircraft logistic centers. One of those technology pulls is shared control. Small batch sizes, feature uncertainty, and varying work load conspire to make classic industrial robotic solutions impractical. One can view ALC process problems in the context of space robotics without the time delay. The ALC's will benefit greatly from the implementation of a common architecture that supports a range of control actions from fully autonomous to teleoperated. Working with national laboratories and private industry, we hope to transition shared control technology to the depot floor. This paper provides an overview of the RACE internal initiatives and customer support, with particular emphasis on production processes that will benefit from shared control technology.
Author (revised)

N93-32123*# Air Force Systems Command, Wright-Patterson AFB, OH. Manufacturing Technology Directorate.
AUTOMATED ASSEMBLY CENTER (AAC) Abstract only **c14**
Robert J. Stauffer *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 212 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

The objectives of this project are as follows: to integrate advanced assembly and assembly support technology under a comprehensive architecture; to implement automated assembly technologies in the production of high-visibility DOD weapon systems; and to document the improved cost, quality, and lead time. This will enhance the production of DOD weapon systems by utilizing the latest commercially available technologies combined into a flexible system that will be able to readily incorporate new technologies as they emerge. Automated assembly encompasses the following areas: product data, process planning, information management policies and framework, three schema architecture, open systems communications, intelligent robots, flexible multi-ability end effectors, knowledge-based/expert systems, intelligent workstations, intelligent sensor systems, and PDES/PDDI data standards.
Author (revised)

N93-32124*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
AN OVERVIEW OF THE KENNEDY SPACE CENTER ROBOTICS PROGRAM **c18**
Eric L. Rhodes *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 213-22 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

The KSC program has the ability to prove the soundness of a particular

robotic concept on the ground before it is used in space. In this context, three (3) robotic systems are discussed: the tile robot (Tessellator); HFIR (High Efficiency Particulate Air (HEPA) Filter Inspection Robot); and ARID (Automatic Radiator Inspection Project). The Tessellator is a semi-autonomous robotic system used to rewaterproof and inspect thermal protection system tiles on the underside of the orbiter. The HFIR is used for autonomous inspection of HEPA filters located at the top of the LC 39 payload changeout rooms. The ARID is designed for autonomous inspection of orbiter radiators for damage while in the orbiter processing facility.

Author (revised)

N93-32125*# Texas Univ., Austin. Dept. of Mechanical Engineering.

ON THE DESIGN OF FAULT-TOLERANT ROBOTIC MANIPULATOR SYSTEMS Abstract only **c37**

Delbert Tesar *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 223 (For primary document see N93-32097 12-99)

Avail: CASI HC A01/MF A04

Robotic systems are finding increasing use in space applications. Many of these devices are going to be operational on board the Space Station Freedom. Fault tolerance has been deemed necessary because of the criticality of the tasks and the inaccessibility of the systems to maintenance and repair. Design for fault tolerance in manipulator systems is an area within robotics that is without precedence in the literature. In this paper, we will attempt to lay down the foundations for such a technology. Design for fault tolerance demands new and special approaches to design, often at considerable variance from established design practices. These design aspects, together with reliability evaluation and modeling tools, are presented. Mechanical architectures that employ protective redundancies at many levels and have a modular architecture are then studied in detail. Once a mechanical architecture for fault tolerance has been derived, the chronological stages of operational fault tolerance are investigated. Failure detection, isolation, and estimation methods are surveyed, and such methods for robot sensors and actuators are derived. Failure recovery methods are also presented for each of the protective layers of redundancy. Failure recovery tactics often span all of the layers of a control hierarchy. Thus, a unified framework for decision-making and control, which orchestrates both the nominal redundancy management tasks and the failure management tasks, has been derived. The well-developed field of fault-tolerant computers is studied next, and some design principles relevant to the design of fault-tolerant robot controllers are abstracted. Conclusions are drawn, and a road map for the design of fault-tolerant manipulator systems is laid out with recommendations for a 10 DOF arm with dual actuators at each joint.

Author (revised)

N93-32126*# Air Force Systems Command, Griffiss AFB, NY. Rome Lab.

ADVANCED ARTIFICIAL INTELLIGENCE TECHNOLOGY TESTBED **c63**

Craig S. Anken *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 226-232 (For primary document see N93-32097 12-99)

Avail: CASI HC A02/MF A04

The Advanced Artificial Intelligence Technology Testbed (AAITT) is a laboratory testbed for the design, analysis, integration, evaluation, and exercising of large-scale, complex, software systems, composed of both knowledge-based and conventional components. The AAITT assists its users in the following ways: configuring various problem-solving application suites; observing and measuring the behavior of these applications and the interactions between their constituent modules; gathering and analyzing statistics about the occurrence of key events; and flexibly and quickly altering the interaction of modules within the applications for further study.

Author (revised)

N93-32127*# Air Force Systems Command, Griffiss AFB, NY. Rome Lab.

KNOWLEDGE-BASED SIMULATION USING OBJECT-ORIENTED PROGRAMMING **c61**

Karen M. Sidoran *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 233-237 (For primary document see N93-32097 12-99)

Avail: CASI HC A01/MF A04

Simulations have become a powerful mechanism for understanding and modeling complex phenomena. Their results have had substantial impact on a broad range of decisions in the military, government, and industry. Because of this, new techniques are continually being explored and developed to make them even more useful, understandable, extendable, and efficient. One such area of research is the application of the knowledge-based methods of artificial intelligence (AI) to the computer simulation field. The goal of knowledge-based simulation is to facilitate building simulations of greatly increased power and comprehensibility by making use of deeper knowledge about the behavior of the simulated world. One technique for representing and manipulating knowledge that has been enhanced by the AI community is object-oriented programming. Using this technique, the entities of a discrete-event simulation can be viewed as objects in an object-oriented formulation. Knowledge can be factual (i.e., attributes of an entity) or behavioral (i.e., how the entity is to behave in certain circumstances). Rome Laboratory's Advanced Simulation Environment (RASE) was developed as a research vehicle to provide an enhanced simulation development environment for building more intelligent, interactive, flexible, and realistic simulations. This capability will support current and future battle management research and provide a test of the object-oriented paradigm for use in large scale military applications.

Author (revised)

N93-32128*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

GENERATION AND EXPLORATION OF AGGREGATION ABSTRACTIONS FOR SCHEDULING AND RESOURCE ALLOCATION Abstract only **c81**

Michael R. Lowry and Theodore A. Linden (Advanced Decision Systems, Mountain View, CA.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 238 (For primary document see N93-32097 12-99)

Avail: CASI HC A01/MF A04

This paper presents research on the abstraction of computational theories for scheduling and resource allocation. The paper describes both theory and methods for the automated generation of aggregation abstractions and approximations in which detailed resource allocation constraints are replaced by constraints between aggregate demand and capacity. The interaction of aggregation abstraction generation with the more thoroughly investigated abstractions of weakening operator preconditions is briefly discussed. The purpose of generating abstract theories for aggregated demand and resources includes: answering queries about aggregate properties, such as gross feasibility; reducing computational costs by using the solution of aggregate problems to guide the solution of detailed problems; facilitating reformulating theories to approximate problems for which there are efficient problem-solving methods; and reducing computational costs of scheduling by providing more opportunities for variable and value-ordering heuristics to be effective. Experiments are being developed to characterize the properties of aggregations that make them cost effective. Both abstract and concrete theories are represented in a variant of first-order predicate calculus, which is a parameterized multi-sorted logic that facilitates specification of large problems. A particular problem is conceptually represented as a set of ground sentences that is consistent with a quantified theory.

Author (revised)

N93-32129*# Ambassador Coll., Big Sandy, TX. Computer Information Systems Dept.

PROTOCOLS FOR DISTRIBUTIVE SCHEDULING **c81**

Stephen F. Richards and Barry Fox (McDonnell-Douglas Space Systems Co., Houston, TX.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 239-249 (For primary document see N93-32097 12-99)

Avail: CASI HC A03/MF A04

The increasing complexity of space operations and the inclusion of interorganizational and international groups in the planning and control of space missions lead to requirements for greater communication, coordination, and cooperation among mission schedulers. These schedulers must jointly

allocate scarce shared resources among the various operational and mission oriented activities while adhering to all constraints. This scheduling environment is complicated by such factors as the presence of varying perspectives and conflicting objectives among the schedulers, the need for different schedulers to work in parallel, and limited communication among schedulers. Smooth interaction among schedulers requires the use of protocols that govern such issues as resource sharing, authority to update the schedule, and communication of updates. This paper addresses the development and characteristics of such protocols and their use in a distributed scheduling environment that incorporates computer-aided scheduling tools. An example problem is drawn from the domain of space shuttle mission planning. Author (revised)

N93-32130*# Honeywell, Inc., Minneapolis, MN.
SCHEDULING WITH PARTIAL ORDERS AND A CAUSAL MODEL c81
Mark Boddy, Jim Carciofini, and George D. Hadden *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 251-258 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

In an ongoing project at Honeywell SRC, we are constructing a prototype scheduling system for a NASA domain using the 'Time Map Manager' (TMM). The TMM representations are flexible enough to permit the representation of precedence constraints, metric constraints between activities, and constraints relative to a variety of references (e.g., Mission Elapsed Time vs. Mission Day). The TMM also supports a simple form of causal reasoning (projection), dynamic database updates, and monitoring specified database properties as changes occur over time. The greatest apparent advantage to using the TMM is the flexibility added to the scheduling process: schedules are constructed by a process of 'iterative refinement,' in which scheduling decisions correspond to constraining an activity either with respect to another activity or with respect to one time line. The schedule becomes more detailed as activities and constraints are added. Undoing a scheduling decision means removing a constraint, not removing an activity from a specified place on the time line. For example, we can move an activity around on the time line by deleting constraints and adding new ones. Author (revised)

N93-32131*# Air Force Systems Command, Griffiss AFB, NY. Rome Lab.
CRISIS ACTION PLANNING AND REPLANNING USING SIPE-2 c81
Jennifer D. Skidmore *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 259-264 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

Rome Laboratory and DARPA are jointly sponsoring an initiative to develop the next generation of AI planning and scheduling technology focused on military operations planning, especially for crisis situations. SRI International has demonstrated their knowledge-based planning technology in this domain with a system called SOCAP, System for Operations Crisis Action Planning. SOCAP's underlying power comes from SIPE-2, a hierarchical, domain-independent, nonlinear AI planner also developed at SRI. This paper discusses the features of SIPE-2 that made it an ideal choice for military operations planning and which contributed greatly to SOCAP's success. Author (revised)

N93-32132*# Air Force Systems Command, Griffiss AFB, NY. Rome Lab.
COMBINING QUALITATIVE AND QUANTITATIVE SPATIAL AND TEMPORAL INFORMATION IN A HIERARCHICAL STRUCTURE: APPROXIMATE REASONING FOR PLAN EXECUTION MONITORING c81
Louis J. Hoebel *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 265-274 Prepared in cooperation with Rochester Univ., NY (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

The problem of plan generation (PG) and the problem of plan execution monitoring (PEM), including updating, queries, and resource-bounded replanning, have different reasoning and representation requirements. PEM requires the integration of qualitative and quantitative information. PEM is the receiving of data about the world in which a plan or agent is executing. The problem is to quickly determine the relevance of the data, the consistency of the data with respect to the expected effects, and if execution should continue. Only spatial and temporal aspects of the plan are addressed for relevance in this work. Current temporal reasoning systems are deficient in computational aspects or expressiveness. This work presents a hybrid qualitative and quantitative system that is fully expressive in its assertion language while offering certain computational efficiencies. In order to proceed, methods incorporating approximate reasoning using hierarchies, notions of locality, constraint expansion, and absolute parameters need be used and are shown to be useful for the anytime nature of PEM.
Author (revised)

N93-32133*# Carnegie-Mellon Univ., Pittsburgh, PA. Center for Integrated Manufacturing Decision Systems.
THE MICRO-BOSS SCHEDULING SYSTEM: CURRENT STATUS AND FUTURE EFFORTS c81
Norman M. Sadeh *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 275-279 Sponsored in part by DOD, McDonnell Aircraft Co., and Digital Equipment Corp. (For primary document see N93-32097 12-99)
(Contract F30602-88-C-0001)
Avail: CASI HC A01/MF A04

In this paper, a micro-opportunistic approach to factory scheduling was described that closely monitors the evolution of bottlenecks during the construction of the schedule, and continuously redirects search towards the bottleneck that appears to be most critical. This approach differs from earlier opportunistic approaches, as it does not require scheduling large resource subproblems or large job subproblems before revising the current scheduling strategy. This micro-opportunistic approach was implemented in the context of the MICRO-BOSS factory scheduling system. A study comparing MICRO-BOSS against a macro-opportunistic scheduler suggests that the additional flexibility of the micro-opportunistic approach to scheduling generally yields important reductions in both tardiness and inventory.
Author (revised)

N93-32134*# Heuristicrats, Berkeley, CA.
DECISION-THEORETIC CONTROL OF EUVE TELESCOPE SCHEDULING c81
Othar Hansson and Andrew Mayer (California Univ., Berkeley.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 280-287 (For primary document see N93-32097 12-99)
(Contract NAS2-13340)
Avail: CASI HC A02/MF A04

This paper describes a decision theoretic scheduler (DTS) designed to employ state-of-the-art probabilistic inference technology to speed the search for efficient solutions to constraint-satisfaction problems. Our approach involves assessing the performance of heuristic control strategies that are normally hard-coded into scheduling systems and using probabilistic inference to aggregate this information in light of the features of a given problem. The Bayesian Problem-Solver (BPS) introduced a similar approach to solving single agent and adversarial graph search patterns yielding orders-of-magnitude improvement over traditional techniques. Initial efforts suggest that similar improvements will be realizable when applied to typical constraint-satisfaction scheduling problems. Author (revised)

N93-32135*# Maryland Univ., College Park. Dept. of Computer Science.
MASSIVELY PARALLEL SUPPORT FOR A CASE-BASED PLANNING SYSTEM c62
Brian P. Kettler, James A. Hendler, and William A. Anderson *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 288-295 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

Case-based planning (CBP), a kind of case-based reasoning, is a technique in which previously generated plans (cases) are stored in memory and can be reused to solve similar planning problems in the future. CBP can save considerable time over generative planning, in which a new plan is produced from scratch. CBP thus offers a potential (heuristic) mechanism for handling intractable problems. One drawback of CBP systems has

been the need for a highly structured memory to reduce retrieval times. This approach requires significant domain engineering and complex memory indexing schemes to make these planners efficient. In contrast, our CBP system, CaPER, uses a massively parallel frame-based AI language (PARKA) and can do extremely fast retrieval of complex cases from a large, unindexed memory. The ability to do fast, frequent retrievals has many advantages: indexing is unnecessary; very large case bases can be used; memory can be probed in numerous alternate ways; and queries can be made at several levels, allowing more specific retrieval of stored plans that better fit the target problem with less adaptation. In this paper we describe CaPER's case retrieval techniques and some experimental results showing its good performance, even on large case bases. Author

N93-32136*# Stanford Univ., CA. Robotics Lab.
AGENT ORIENTED PROGRAMMING: AN OVERVIEW OF THE FRAMEWORK AND SUMMARY OF RECENT RESEARCH c61
Yoav Shoham *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 296-304 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

This is a short overview of the agent-oriented programming (AOP) framework. AOP can be viewed as an specialization of object-oriented programming. The state of an agent consists of components called beliefs, choices, capabilities, commitments, and possibly others; for this reason the state of an agent is called its mental state. The mental state of agents is captured formally in an extension of standard epistemic logics: beside temporalizing the knowledge and belief operators, AOP introduces operators for commitment, choice and capability. Agents are controlled by agent programs, which include primitives for communicating with other agents. In the spirit of speech-act theory, each communication primitive is of a certain type: informing, requesting, offering, etc. This document describes these features in more detail and summarizes recent results and ongoing AOP-related work. Author (revised)

N93-32137*# Advanced Decision Systems, Mountain View, CA.
DECISION THEORY FOR COMPUTING VARIABLE AND VALUE ORDERING DECISIONS FOR SCHEDULING PROBLEMS Abstract only c81
Theodore A. Linden *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 305 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

Heuristics that guide search are critical when solving large planning and scheduling problems, but most variable and value ordering heuristics are sensitive to only one feature of the search state. One wants to combine evidence from all features of the search state into a subjective probability that a value choice is best, but there has been no solid semantics for merging evidence when it is conceived in these terms. Instead, variable and value ordering decisions should be viewed as problems in decision theory. This led to two key insights: (1) The fundamental concept that allows heuristic evidence to be merged is the net incremental utility that will be achieved by assigning a value to a variable. Probability distributions about net incremental utility can merge evidence from the utility function, binary constraints, resource constraints, and other problem features. The subjective probability that a value is the best choice is then derived from probability distributions about net incremental utility. (2) The methods used for rumor control in Bayesian Networks are the primary way to prevent cycling in the computation of probable net incremental utility. These insights lead to semantically justifiable ways to compute heuristic variable and value ordering decisions that merge evidence from all available features of the search state. Author (revised)

N93-32138*# McDonnell-Douglas Space Systems Co., Houston, TX. Space Station Div.
IMPLEMENTING A REAL TIME REASONING SYSTEM FOR ROBUST DIAGNOSIS c38
Tim Hill, William Morris, and Charlie Robertson *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 307-312 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

The objective of the Thermal Control System Automation Project (TCSAP) is to develop an advanced fault detection, isolation, and recovery (FDIR) capability for use on the Space Station Freedom (SSF) External Active Thermal Control System (EATCS). Real-time monitoring, control, and diagnosis of the EATCS will be performed with a knowledge based system (KBS). Implementation issues for the current version of the KBS are discussed. Author

N93-32139*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Artificial Intelligence Group.
ATTENTION FOCUSSING AND ANOMALY DETECTION IN REAL-TIME SYSTEMS MONITORING c35
Richard J. Doyle, Steve A. Chien, Usama M. Fayyad, and Harry J. Porta *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 314-319 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

In real-time monitoring situations, more information is not necessarily better. When faced with complex emergency situations, operators can experience information overload and a compromising of their ability to react quickly and correctly. We describe an approach to focusing operator attention in real-time systems monitoring based on a set of empirical and model-based measures for determining the relative importance of sensor data. Author

N93-32140*# Oregon State Univ., Corvallis.
MIXED DATA/GOAL DRIVEN INTELLIGENT REAL-TIME ASSESSMENT AND CONTROL Abstract only c61
Bruce DAmbrosio *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 320 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

We describe work in progress to develop model-based systems for real-time assessment and control of complex systems. Intelligent real-time processing must balance accuracy and response-time requirements to maximize expected performance. We use brief (probability) and goal (utility) information to guide construction of an approximate system model on which we then apply approximate inference procedures to yield timely, effective assessments and control decisions. Author

N93-32141*# General Electric Co., Moorestown, NJ.
INTEGRATION OF DOMAIN AND RESOURCE-BASED REASONING FOR REAL-TIME CONTROL IN DYNAMIC ENVIRONMENTS c61
Keith Morgan, Kenneth R. Whitebread, Michael Kendus, and Andrew S. Cromarty (Distributed Systems Technology, Palo Alto, CA.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 321-326 Sponsored by DARPA (For primary document see N93-32097 12-99)
(Contract MDA972-90-C-0005; ARPA Order 6661/50)
Avail: CASI HC A02/MF A04

A real-time software controller that successfully integrates domain-based and resource-based control reasoning to perform task execution in a dynamically changing environment is described. The design of the controller is based on the concept of partitioning the process to be controlled into a set of tasks, each of which achieves some process goal. It is assumed that, in general, there are multiple ways (tasks) to achieve a goal. The controller dynamically determines current goals and their current criticality, choosing and scheduling tasks to achieve those goals in the time available. It incorporates rule-based goal reasoning, a TMS-based criticality propagation mechanism, and a real-time scheduler. The controller has been used to build a knowledge-based situation assessment system that formed a major component of a real-time, distributed, cooperative problem solving system built under DARPA contract. It is also being employed in other applications now in progress. Author (revised)

N93-32142*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

AN ON-LINE EXPERT SYSTEM FOR DIAGNOSING ENVIRONMENTALLY INDUCED SPACECRAFT ANOMALIES USING CLIPS c61

Michael Lauriente, Mark Rolincik (University Research Foundation, Greenbelt, MD.), Harry C Koons (Aerospace Corp., Los Angeles, CA.), and David Gorney (Aerospace Corp., Los Angeles, CA.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 329-339 (For primary document see N93-32097 12-99)

Avail: CASI HC A03/MF A04

A new rule-based, expert system for diagnosing spacecraft anomalies is under development. The knowledge base consists of over two-hundred rules and provide links to historical and environmental databases. Environmental causes considered are bulk charging, single event upsets (SEU), surface charging, and total radiation dose. The system's driver translates forward chaining rules into a backward chaining sequence, prompting the user for information pertinent to the causes considered. The use of heuristics frees the user from searching through large amounts of irrelevant information (varying degrees of confidence in an answer) or 'unknown' to any question. The expert system not only provides scientists with needed risk analysis and confidence estimates not available in standard numerical models or databases, but it is also an effective learning tool. In addition, the architecture of the expert system allows easy additions to the knowledge base and the database. For example, new frames concerning orbital debris and ionospheric scintillation are being considered. The system currently runs on a MicroVAX and uses the C Language Integrated Production System (CLIPS). Author (revised)

N93-32143*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

USING MACHINE LEARNING TECHNIQUES TO AUTOMATE SKY SURVEY CATALOG GENERATION c82

Usama M. Fayyad, J. C. Roden, R. J. Doyle, Nicholas Weir (California Inst. of Tech., Pasadena.), and S. G. Djorgovski (California Inst. of Tech., Pasadena.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 340-348 (For primary document see N93-32097 12-99)

Avail: CASI HC A02/MF A04

We describe the application of machine classification techniques to the development of an automated tool for the reduction of a large scientific data set. The 2nd Palomar Observatory Sky Survey provides comprehensive photographic coverage of the northern celestial hemisphere. The photographic plates are being digitized into images containing on the order of 10(exp 7) galaxies and 10(exp 8) stars. Since the size of this data set precludes manual analysis and classification of objects, our approach is to develop a software system which integrates independently developed techniques for image processing and data classification. Image processing routines are applied to identify and measure features of sky objects. Selected features are used to determine the classification of each object. GID3* and O-BTree, two inductive learning techniques, are used to automatically learn classification decision trees from examples. We describe the techniques used, the details of our specific application, and the initial encouraging results which indicate that our approach is well-suited to the problem. The benefits of the approach are increased data reduction throughput, consistency of classification, and the automated derivation of classification rules that will form an objective, examinable basis for classifying sky objects. Furthermore, astronomers will be freed from the tedium of an intensely visual task to pursue more challenging analysis and interpretation problems given automatically cataloged data. Author (revised)

N93-32144*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

INTELLIGENT ASSISTANCE IN SCIENTIFIC DATA PREPARATION c82

Steve Chien, R. Kirk Kandt, Joseph Roden, Richard J. Doyle, Scott Burleigh, Todd King (California Univ., Los Angeles.), and Steve Joy (California Univ., Los Angeles.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 349-354 (For primary document see N93-32097 12-99)

Avail: CASI HC A02/MF A04

Scientific data preparation is the process of extracting usable scientific data from raw instrument data. This task involves noise detection (and subsequent noise classification and flagging or removal), extracting data from compressed forms, and construction of derivative or aggregate data (e.g. spectral densities or running averages). A software system called PIPE provides intelligent assistance to users developing scientific data preparation plans using a programming language called Master Plumber. PIPE provides this assistance capability by using a process description to create a dependency model of the scientific data preparation plan. This dependency model can then be used to verify syntactic and semantic constraints on processing steps to perform limited plan validation. PIPE also provides capabilities for using this model to assist in debugging faulty data preparation plans. In this case, the process model is used to focus the developer's attention upon those processing steps and data elements that were used in computing the faulty output values. Finally, the dependency model of a plan can be used to perform plan optimization and run time estimation. These capabilities allow scientists to spend less time developing data preparation procedures and more time on scientific analysis tasks. Author

N93-32145*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PROCESS CONTROL AND RECOVERY IN THE LINK MONITOR AND CONTROL OPERATOR ASSISTANT c32

Lorrine Lee and Randall W. Hill, Jr. *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 355-362 (For primary document see N93-32097 12-99)

Avail: CASI HC A02/MF A04

This paper describes our approach to providing process control and recovery functions in the Link Monitor and Control Operator Assistant (LMCOA). The focus of the LMCOA is to provide semi-automated monitor and control to support station operations in the Deep Space Network. The LMCOA will be demonstrated with precalibration operations for Very Long Baseline Interferometry on a 70-meter antenna. Precalibration, the task of setting up the equipment to support a communications link with a spacecraft, is a manual, time consuming and error-prone process. One problem with the current system is that it does not provide explicit feedback about the effects of control actions. The LMCOA uses a Temporal Dependency Network (TDN) to represent an end-to-end sequence of operational procedures and a Situation Manager (SM) module to provide process control, diagnosis, and recovery functions. The TDN is a directed network representing precedence, parallelism, precondition, and postcondition constraints. The SM maintains an internal model of the expected and actual states of the subsystems in order to determine if each control action executed successfully and to provide feedback to the user. The LMCOA is implemented on a NeXT workstation using Objective C, Interface Builder and the C Language Integrated Production System.

Author (revised)

N93-32146*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

DESSY: MAKING A REAL-TIME EXPERT SYSTEM ROBUST AND USEFUL c61

Sherry A. Land, Jane T. Malin, and Donald R. Culp (Rockwell International Corp., Houston, TX.) *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 364-37 (For primary document see N93-32097 12-99)

Avail: CASI HC A02/MF A04

As the complexity and expected life-span of modern space systems continue to increase, the need for real-time data monitoring and failure analysis becomes more critical to their successful operation. The DEcision Support SYstem (DESSY) is a joint effort by the Intelligent Systems Branch/ER2 and the Remote Manipulator System (RMS) Section/DF44 to develop an expert system for the monitoring of the Payload Deployment and Retrieval System (PDRS). DESSY users, the RMS flight controllers, are provided with user interface enhancements and automated monitoring of system state (physical orientation) and status (operational health). Currently, a DESSY prototype for the Manipulator Positioning Mechanism (MPM) and Manipulator Retention Latches (MRL) of the PDRS has been developed and successfully demonstrated during the STS-49 and STS-46 missions. Expert systems for monitoring real-time operations must not only accurately represent domain knowledge, but also address the challenges of using unfiltered real-time data as input. This paper describes the methods and design strategies developed to overcome problems with real-time data

in the NASA Mission Control Center. Types of data problems addressed are as follows: (1) loss of data; (2) erratic data; and (3) data lags and irregularities during state transition. Methods used to handle data problems include rule disabling for ignoring data when data quality is uncertain, context-sensitive bounded pattern recognition for minimizing incorrect conclusions based on bad data, and graceful recovery through system correction when reliable data returns. This combination of methods with an object-based modular DESSY design assures a robust program capable of lengthy periods of uninterrupted use in operations. Author (revised)

N93-32147*# Illinois Univ., Urbana. Dept. of Computer Science.
PERTS: A PROTOTYPING ENVIRONMENT FOR REAL-TIME SYSTEMS c61
Jane W. S. Liu, Kwei-Jay Lin, and C. L. Liu *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 372-379 Sponsored in part by ONR (For primary document see N93-32097 12-99)
(Contracts N00014-89-J-1181; N00014-92-J-1815)
Avail: CASI HC A02/MF A04

PERTS is a prototyping environment for real-time systems. It is being built incrementally and will contain basic building blocks of operating systems for time-critical applications, tools, and performance models for the analysis, evaluation and measurement of real-time systems and a simulation/emulation environment. It is designed to support the use and evaluation of new design approaches, experimentations with alternative system building blocks, and the analysis and performance profiling of prototype real-time systems. Author (revised)

N93-32148*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
THE COMPUTER INTEGRATED DOCUMENTATION PROJECT: A MERGE OF HYPERMEDIA AND AI TECHNIQUES c63
Nathalie Mathe and Guy Boy (Office National d'Etudes et de Recherches Aerospatiales, Labege, France.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 381-389 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

To generate intelligent indexing that allows context-sensitive information retrieval, a system must be able to acquire knowledge directly through interaction with users. In this paper, we present the architecture for CID (Computer Integrated Documentation). CID is a system that enables integration of various technical documents in a hypertext framework and includes an intelligent browsing system that incorporates indexing in context. CID's knowledge-based indexing mechanism allows case based knowledge acquisition by experimentation. It utilizes on-line user information requirements and suggestions either to reinforce current indexing in case of success or to generate new knowledge in case of failure. This allows CID's intelligent interface system to provide helpful responses, based on previous experience (user feedback). We describe CID's current capabilities and provide an overview of our plans for extending the system. Author (revised)

N93-32149*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
INFORMATION FOR THE USER IN DESIGN OF INTELLIGENT SYSTEMS c63
Jane T. Malin and Debra L. Schreckenghost (Mitre Corp., Houston, TX.) *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 390-39 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

Recommendations are made for improving intelligent system reliability and usability based on the use of information requirements in system development. Information requirements define the task-relevant messages exchanged between the intelligent system and the user by means of the user interface medium. Thus, these requirements affect the design of both the intelligent system and its user interface. Many difficulties that users have in interacting with intelligent systems are caused by information problems. These information problems result from the following: (1) not providing the right information to support domain tasks; and (2) not recognizing that using an intelligent system introduces new user supervisory tasks that require new types of information. These problems are especially prevalent in intelligent systems used for real-time space operations, where data problems and unexpected situations are common. Information problems can be solved by deriving information requirements from a description of user tasks. Using information requirements embeds human-computer interaction design into intelligent system prototyping, resulting in intelligent systems that are more robust and easier to use. Author (revised)

N93-32150*# Illinois Univ., Urbana. Dept. of Computer Science.
PRODUCING APPROXIMATE ANSWERS TO DATABASE QUERIES c82
Susan V. Vrbsky and Jane W. S. Liu *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 398-405 Sponsored in part by ONR and AFOSR (For primary document see N93-32097 12-99)
(Contract NAG1-613; N00014-92-J-1146; AF-AFOSR-1-5-26932)
Avail: CASI HC A02/MF A04

We have designed and implemented a query processor, called APPROXIMATE, that makes approximate answers available if part of the database is unavailable or if there is not enough time to produce an exact answer. The accuracy of the approximate answers produced improves monotonically with the amount of data retrieved to produce the result. The exact answer is produced if all of the needed data are available and query processing is allowed to continue until completion. The monotone query processing algorithm of APPROXIMATE works within the standard relational algebra framework and can be implemented on a relational database system with little change to the relational architecture. We describe here the approximation semantics of APPROXIMATE that serves as the basis for meaningful approximations of both set-valued and single-valued queries. We show how APPROXIMATE is implemented to make effective use of semantic information, provided by an object-oriented view of the database, and describe the additional overhead required by APPROXIMATE. Author

N93-32151*# Air Force Systems Command, Brooks AFB, TX.
A PRELIMINARY EMPIRICAL EVALUATION OF VIRTUAL REALITY AS AN INSTRUCTIONAL MEDIUM FOR VISUAL-SPATIAL TASKS Abstract only c54
J. Wesley Regian, Wayne Shebilske, and John M. Monk (Galaxy Scientific Corp., Lackland AFB, TX.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 406 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

We explored the training potential of Virtual Reality (VR) technology. Thirty-one adults were trained and tested on spatial skills in a VR. They learned a sequence of button and knob responses on a VR console and performed flawlessly on the same console. Half were trained with a rote strategy; the rest used a meaningful strategy. Response times were equivalent for both groups and decreased significantly over five test trials indicating that learning continued on VR tests. The same subjects practiced navigating through a VR building, which had three floors with four rooms on each floor. The dependent measure was the number of rooms traversed on routes that differed from training routes. Many subjects completed tests in the fewest rooms possible. All subjects learned configurational knowledge according to the criterion of taking paths that were significantly shorter than those predicted by a random walk as determined by a Monte Carlo analysis. The results were discussed as a departure point for empirically testing the training potential of VR technology. Author

N93-32152*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
A DECISION-THEORETIC APPROACH TO THE DISPLAY OF INFORMATION FOR TIME-CRITICAL DECISIONS: THE VISTA PROJECT c54
Eric Horvitz (Rockwell International Science Center, Palo Alto, CA.), Corinne Ruokangas (Rockwell International Science Center, Palo Alto, CA.), Sampath Srinivas (Rockwell International Science Center, Palo Alto, CA.), and Matthew Barry *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 407-41 (For primary document see N93-32097 12-99)
Avail: CASI HC A03/MF A04

We describe a collaborative research and development effort between the Palo Alto Laboratory of the Rockwell Science Center, Rockwell Space Operations Company, and the Propulsion Systems Section of NASA JSC to design computational tools that can manage the complexity of information displayed to human operators in high-stakes, time-critical decision contexts. We shall review an application from NASA Mission Control and describe how we integrated a probabilistic diagnostic model and a time-dependent utility model, with techniques for managing the complexity of computer displays. Then, we shall describe the behavior of VPROP, a system constructed to demonstrate promising display-management techniques. Finally, we shall describe our current research directions on the Vista 2 follow-on project. Author (revised)

N93-32153*# Maryland Univ., College Park. Dept. of Computer Science.
COOPERATIVE ANSWERS IN DATABASE SYSTEMS c82
Terry Gaasterland, Parke Godfrey, Jack Minker, and Lev Novik *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 418-425 Sponsored in part by AFOSR and NSF (For primary document see N93-32097 12-99)
(Grants AF-AFOSR-0350-91; NSF IRI-89-16059)
Avail: CASI HC A02/MF A04

A major concern of researchers who seek to improve human-computer communication involves how to move beyond literal interpretations of queries to a level of responsiveness that takes the user's misconceptions, expectations, desires, and interests into consideration. At Maryland, we are investigating how to better meet a user's needs within the framework of the cooperative answering system of Gal and Minker. We have been exploring how to use semantic information about the database to formulate coherent and informative answers. The work has two main thrusts: (1) the construction of a logic formula which embodies the content of a cooperative answer; and (2) the presentation of the logic formula to the user in a natural language form. The information that is available in a deductive database system for building cooperative answers includes integrity constraints, user constraints, the search tree for answers to the query, and false presuppositions that are present in the query. The basic cooperative answering theory of Gal and Minker forms the foundation of a cooperative answering system that integrates the new construction and presentation methods. This paper provides an overview of the cooperative answering strategies used in the CARMIN cooperative answering system, an ongoing research effort at Maryland. Section 2 gives some useful background definitions. Section 3 describes techniques for collecting cooperative logical formulae. Section 4 discusses which natural language generation techniques are useful for presenting the logic formula in natural language text. Section 5 presents a diagram of the system. Author (revised)

N93-32154*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SOFTWARE ENGINEERING c61
Ernest M. Fridge, III, Jim Hiott (Paramax Systems Corp., Houston, TX.), Jim Golej (Mitre Corp., Houston, TX.), and Allan Plumb (Barrios Technology, Inc., Houston, TX.) *In its* The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 427-43 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

Today's software systems generally use obsolete technology, are not integrated properly with other software systems, and are difficult and costly to maintain. The discipline of reverse engineering is becoming prominent as organizations try to move their systems up to more modern and maintainable technology in a cost effective manner. The Johnson Space Center (JSC) created a significant set of tools to develop and maintain FORTRAN and C code during development of the space shuttle. This tool set forms the basis for an integrated environment to reengineer existing code into modern software engineering structures which are then easier and less costly to maintain and which allow a fairly straightforward translation into other target languages. The environment will support these structures and practices even in areas where the language definition and compilers do not enforce good software engineering. The knowledge and data captured using the reverse engineering tools is passed to standard forward engineering tools to redesign or perform major upgrades to software systems in a much more cost effective manner than using older technologies. The latest release of the environment was in Feb. 1992. Author (revised)

N93-32155*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AUTOMATION AND HYPERMEDIA TECHNOLOGY APPLICATIONS c82
Joseph H. Jupin, Edward W. Ng, and Mark L. James *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 437-443 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

This paper represents a progress report on HyLite (Hypermedia Library technology): a research and development activity to produce a versatile system as part of NASA's technology thrusts in automation, information sciences, and communications. HyLite can be used as a system or tool to facilitate the creation and maintenance of large distributed electronic libraries. The contents of such a library may be software components, hardware parts or designs, scientific data sets or databases, configuration management information, etc. Proliferation of computer use has made the diversity and quantity of information too large for any single user to sort, process, and utilize effectively. In response to this information deluge, we have created HyLite to enable the user to process relevant information into a more efficient organization for presentation, retrieval, and readability. To accomplish this end, we have incorporated various AI techniques into the HyLite hypermedia engine to facilitate parameters and properties of the system. The proposed techniques include intelligent searching tools for the libraries, intelligent retrievals, and navigational assistance based on user histories. HyLite itself is based on an earlier project, the Encyclopedia of Software Components (ESC) which used hypermedia to facilitate and encourage software reuse. Author (revised)

N93-32156*# Air Force Systems Command, Griffiss AFB, NY. Rome Lab.
THE KNOWLEDGE-BASED SOFTWARE ASSISTANT: BEYOND CASE c61
Joseph A. Carozzoni *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 445-452 (For primary document see N93-32097 12-99)
Avail: CASI HC A02/MF A04

This paper will outline the similarities and differences between two paradigms of software development. Both support the whole software life cycle and provide automation for most of the software development process, but have different approaches. The CASE approach is based on a set of tools linked by a central data repository. This tool-based approach is data driven and views software development as a series of sequential steps, each resulting in a product. The Knowledge-Based Software Assistant (KBSA) approach, a radical departure from existing software development practices, is knowledge driven and centers around a formalized software development process. KBSA views software development as an incremental, iterative, and evolutionary process with development occurring at the specification level. Author (revised)

N93-32157*# Air Force Systems Command, Griffiss AFB, NY. Rome Lab.
ARIES: ACQUISITION OF REQUIREMENTS AND INCREMENTAL EVOLUTION OF SPECIFICATIONS c61
Nancy A. Roberts *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 453-456 (For primary document see N93-32097 12-99)
Avail: CASI HC A01/MF A04

This paper describes a requirements/specification environment specifically designed for large-scale software systems. This environment is called ARIES (Acquisition of Requirements and Incremental Evolution of Specifications). ARIES provides assistance to requirements analysts for developing operational specifications of systems. This development begins with the acquisition of informal system requirements. The requirements are then formalized and gradually elaborated (transformed) into formal and complete specifications. ARIES provides guidance to the user in validating formal requirements by translating them into natural language representations and graphical diagrams. ARIES also provides ways of analyzing the specification to ensure that it is correct, e.g., testing the specification against a running simulation of the system to be built. Another important ARIES feature, especially when developing large systems, is the sharing and reuse of requirements knowledge. This leads to much less duplication

of effort. ARIES combines all of its features in a single environment that makes the process of capturing a formal specification quicker and easier.
Author

N93-32158*# Air Force Systems Command, Griffiss AFB, NY. Rome Lab.

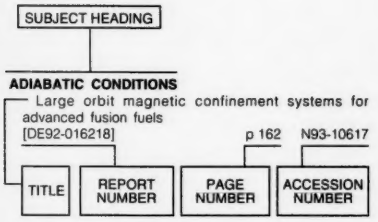
THE ENHANCED SOFTWARE LIFE CYLE SUPPORT ENVIRONMENT (ProSLCSE): AUTOMATION FOR ENTERPRISE AND PROCESS MODELING **c61**

James R. Milligan and James E. Dutton (International Software Systems, Inc., Austin, TX.) *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) Feb. 1993 p 457-464 (For primary document see N93-32097 12-99)

Avail: CASI HC A02/MF A04

In this paper, we have introduced a comprehensive method for enterprise modeling that addresses the three important aspects of how an organization goes about its business. FirstEP includes infrastructure modeling, information modeling, and process modeling notations that are intended to be easy to learn and use. The notations stress the use of straightforward visual languages that are intuitive, syntactically simple, and semantically rich. ProSLCSE will be developed with automated tools and services to facilitate enterprise modeling and process enactment. In the spirit of FirstEP, ProSLCSE tools will also be seductively easy to use. Achieving fully managed, optimized software development and support processes will be long and arduous for most software organizations, and many serious problems will have to be solved along the way. ProSLCSE will provide the ability to document, communicate, and modify existing processes, which is the necessary first step.
Author (revised)

Typical Subject Index Listing



The subject heading is a key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension is added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The page number helps you locate the citation in the abstract section. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus*.

A

ABEL FUNCTION
Most monothetic extensions are rank-1
| REPT-93-05 | p 3813 N93-31546

ABSORPTION CROSS SECTIONS
Geometric model from microscopic theory for nuclear absorption
| NASA-TP-3324 | p 3822 N93-32369

ABSORPTION SPECTRA
Vibrational overtone spectroscopy of cyclic amines: Pyridine and related compounds
| AD-A265524 | p 3704 N93-31919
Effects of the chemical environment on the spectroscopic properties of clays: Applications for Mars p 3862 N93-31936

ABSORPTION SPECTROSCOPY
Vibrational overtone spectroscopy of cyclic amines: Pyridine and related compounds
| AD-A265524 | p 3704 N93-31919

ACCELERATED LIFE TESTS
Efficient fault diagnosis of helicopter gearboxes
| NASA-TM-106253 | p 3735 N93-31846

ACCELERATION TOLERANCE
Transmission of vibration through the human body to the head: A summary of experimental data
| ISVR-TR-218 | p 3774 N93-32237

ACCESS CONTROL
Research in transparent informed prefetching
| AD-A265417 | p 3842 N93-32049
Blocking probabilities in a loss system with arrivals in geometrically distributed batches and heterogeneous service requirements
| MEMO-1074 | p 3812 N93-32392

ACCIDENT INVESTIGATION
Reportable accidents to UK registered aircraft, and to foreign registered aircraft in UK airspace, 1990
| CAP-600 | p 3674 N93-31730

ACCIDENT PREVENTION
Applying MORT maintenance safety analysis in Finnish industry
| VTT-TIED-1332 | p 3714 N93-31545
Maglev guideway and route integrity requirements
| PB93-154870 | p 3736 N93-32086

ACCIDENTS
Near miss reporting in the chemical process industry
| ISBN-9-03-860181-6 | p 3714 N93-31539
Integration of measurements with atmospheric dispersion models: Source term estimation for dispersal of (239)Pu due to non-nuclear detonation of high explosive
| DE93-012550 | p 3766 N93-32295

ACCOMMODATION
Hitchhiker: Customer Accommodations and Requirements Specifications (CARS)
| NASA-TM-109225 | p 3834 N93-31644

ACCOUNTING
Information systems strategies for public financial management
| PB93-186948 | p 3842 N93-32167

ACCRETION DISKS
Imaging circumstellar disks around young stars by multi-aperture interferometry p 3847 N93-31766

ACCURACY
Accuracy estimation for digitizing p 3745 N93-31265
Ground- and satellite-derived flight-path measurements as demonstrated in the AFES Avionics Flight Evaluation System (AFES) p 3677 N93-31281
The application of phase tracking GPS for flight test trajectory determination
| NLR-TP-91349-U | p 3678 N93-32337

ACHONDRITES
On the weathering of Martian igneous rocks p 3862 N93-31941
Aqueous geochemistry on Mars: Possible clues from salts and clays in SNC meteorites p 3863 N93-31944

ACID RAIN
Chemistry and acidity of cloud water at Mount Washington, NH
| PB93-190684 | p 3767 N93-31206

ACIDITY
Chemistry and acidity of cloud water at Mount Washington, NH
| PB93-190684 | p 3767 N93-31206
The Martian ocean: First acid, then alkaline p 3866 N93-31958

ACOUSTIC ATTENUATION
Noise attenuating circuit for mechanical relay including optical isolation
| AD-D015700 | p 3720 N93-31842

ACOUSTIC EXCITATION
Modal measurements and propeller field excitation on acoustic full scale mockup of SAAB 340 aircraft
| FFA-TN-1992-08 | p 3815 N93-31051
Enhanced mixing of a rectangular supersonic jet by natural and induced screech
| NASA-TM-106245 | p 3672 N93-31672

ACOUSTIC IMPEDANCE
Experiments on a general thermoacoustic engine
| AD-A265864 | p 3817 N93-32317

ACOUSTIC MEASUREMENT
Acoustic logging for structural and hydrogeological bedrock investigations
| VTT-JULK-762 | p 3816 N93-31865
Instrumentation for in-flight acoustic measurements in an engine inlet duct of a Fokker 100 aircraft
| NLR-TP-91200-U | p 3680 N93-32332

ACOUSTIC PROPAGATION
Practical flow duct acoustic modelling
| ISVR-TR-213 | p 3726 N93-31838

ACOUSTIC SCATTERING
An acoustic scattering code
| AD-A265863 | p 3816 N93-32316

ACOUSTIC SOUNDING
Theory and application of a Radio-Acoustic Sounding System (RASS)
| PB93-191252 | p 3769 N93-31815

ACOUSTIC VELOCITY
Acoustic logging for structural and hydrogeological bedrock investigations
| VTT-JULK-762 | p 3816 N93-31865
Near bottom data collection and data analysis
| AD-A265872 | p 3771 N93-32172
Noise from high speed maglev systems: Noise sources, noise criteria, preliminary design guidelines for noise control, and recommendations for acoustical test facility for maglev research
| PB93-154896 | p 3736 N93-32193

ACOUSTICS
Experiments on a general thermoacoustic engine
| AD-A265864 | p 3817 N93-32317

ACOUSTO-OPTICS
AOTF enhancements for a space-based spectropolarimeter
| NASA-CR-193290 | p 3691 N93-31040

ACTINIDE SERIES
Study on laser atomic spectroscopy
| DE93-606193 | p 3703 N93-31824

ACTIVATED CARBON
Kinetics of adsorption from liquid phase on activated carbon
| ETN-93-94042 | p 3703 N93-31521

ACTIVATION ENERGY
Investigation of diamond homoepitaxy by in situ Fizeau interferometry: The role of oxygen
| AD-A265544 | p 3829 N93-31921

ACTIVE CONTROL
Active damping in a flexible manipulator p 3689 N93-31452
Vibration isolation p 3690 N93-31458
Implementing a real time reasoning system for robust diagnosis p 3739 N93-32138
Control of jet noise
| NASA-CR-193552 | p 3816 N93-32221
Active control of flow induced resonance in continuous corrugated tubes
| AD-A265782 | p 3727 N93-32310

ACTUATORS
Development and flight testing of a fault-tolerant fly-by-light yaw control system p 3676 N93-31280
Electropneumatic actuator, phase 1
| PB93-174951 | p 3720 N93-31876
Design and application of Active Magnetic Bearings (AMB) for vibration control p 3738 N93-32279

ADAPTIVE CONTROL
Adaptive array processing in uncertain inhomogeneous media 1992-1993
| AD-A265256 | p 3717 N93-31794
Set-membership identification for robust control design
| AD-A265669 | p 3800 N93-32197

ADAPTIVE OPTICS
Prospects for Earth-based interferometry p 3845 N93-31755
Exploring the limits of adaptive wavefront compensation for ground based astronomical interferometers p 3849 N93-31782
Adaptive optics for high power beam lines using diamond crystal monochromators
| DE93-009328 | p 3824 N93-31987
The application of synthetic-beacon technology to astronomy
| AD-A265146 | p 3850 N93-31990

ADDITIVES
Microscopic origin of marginal Fermi-liquid in strongly correlated spin systems
| DE93-608697 | p 3827 N93-31163

ADIABATIC CONDITIONS
Intuitive approach to modified gyrokinetic equation and numerical confirmation
| DE93-604671 | p 3812 N93-31083
The development of a tungsten heavy alloy that fails by an adiabatic shear mechanism, phase 1
| AD-A265867 | p 3707 N93-32318

ADIABATIC EQUATIONS
Intuitive approach to modified gyrokinetic equation and numerical confirmation
| DE93-604671 | p 3812 N93-31083

Three-neutrino oscillations in matter and topological phases
[DE93-608386] p 3813 N93-31290
Relaxational dynamics and precursor domains in the non-linear shell model
[DE92-642676] p 3820 N93-31805

ADSORBENTS
Novel strategies for the synthesis of methane adsorbents with controlled porosity and high surface area
[PB93-189967] p 3702 N93-31209

ADSORPTION
Kinetics of adsorption from liquid phase on activated carbon
[ETN-93-94042] p 3703 N93-31521
Effect of purity on adsorption capacities of a Mars-like clay mineral at different pressures p 3863 N93-31945
Si atomic layer epitaxy based on Si2H6 and remote He plasma bombardment
[DE93-011674] p 3830 N93-32183

ADVANCED LAUNCH SYSTEM (STS)
Advanced launch system multi-path redundant avionics architecture analysis and characterization
[NASA-CR-4516] p 3795 N93-31642

ADVANCED SOLID ROCKET MOTOR (STS)
Data communication network at the ASRM facility
[NASA-CR-193625] p 3686 N93-32236

ADVANCED VERY HIGH RESOLUTION RADIOMETER
Monitoring vegetation greenness with satellite data
[PB93-190882] p 3744 N93-31213
Condition of the Ross Ice Shelf derived from AVHRR imagery p 3760 N93-31886

ADVECTION
Numerical modelling of mesoscale atmospheric dispersion, volumes 1 and 2 p 3765 N93-32217
Tests on semi-Lagrangian transport and interpolation
[CWI-NM-R921M] p 3756 N93-32393

AERATION
In-situ bioventing: Two US EPA and Air Force sponsored field studies
[PB93-194231] p 3754 N93-32089

AERIAL PHOTOGRAPHY
SPOT satellite mapping of Ice Stream B p 3760 N93-31887
Remote sensing: A powerful aid for the analysis of problems in the north Holland Vechtstreek
[ETN-93-93468] p 3747 N93-32344

AERIAL RECONNAISSANCE
Development of nose structure of a reconnaissance container for a supersonic jet aircraft
[MBB-LME-242-S-PUB-0451] p 3679 N93-31046
Unclassified satellite remote sensing as a component of integrated treaty verification
[DE93-005736] p 3744 N93-31187

AEROACOUSTICS
Noise from high speed maglev systems: Noise sources, noise criteria, preliminary design guidelines for noise control, and recommendations for acoustical test facility for maglev research
[PB93-154896] p 3736 N93-32193
Control of jet noise
[NASA-CR-193552] p 3816 N93-32221

AERODYNAMIC CHARACTERISTICS
Low-speed wind tunnel study of the direct side-force characteristics of a joined-wing airplane with an upper fin
[DE93-767966] p 3672 N93-31189
Definition of an airfoil family for the EUROFAR rotor
[DLR-FB-92-04] p 3679 N93-31197
Three-dimensional flow calculations inside SSME GGGT first stage blade rows p 3697 N93-31585
Localization of aeroelastic modes in mistuned high-energy turbines p 3697 N93-31586
Reynolds number influences in aeronautics
[NASA-TM-107730] p 3673 N93-31732
Supersonic aerodynamic characteristics of an advanced F-16 derivative aircraft configuration
[NASA-TP-3355] p 3673 N93-31733
Development of a method to predict transonic limit cycle oscillation characteristics of fighter aircraft
[NLR-TP-91359-U] p 3679 N93-32338
Panel methods for aerodynamic analysis and design
[NLR-TP-91404-U] p 3674 N93-32357

AERODYNAMIC CONFIGURATIONS
Computational methods for aerodynamic design of aircraft components
[NLR-TP-92072-4] p 3671 N93-31148
Review of aerodynamic design in the Netherlands
[NLR-TP-91260-U] p 3679 N93-31840

AERODYNAMIC INTERFERENCE
A break-down of sting interference effects
[NLR-TP-91220-U] p 3684 N93-31042

AERODYNAMIC LOADS
Overview of aerothermodynamic loads definition study p 3697 N93-31583
Three-dimensional analysis of the Pratt and Whitney alternate design SSME fuel turbine p 3697 N93-31584

AERODYNAMICS
Reynolds number influences in aeronautics
[NASA-TM-107730] p 3673 N93-31732
Aeronautical engineering: A continuing bibliography with indexes (supplement 292)
[NASA-SP-7037(292)] p 3671 N93-32375

AEROELASTICITY
Integrated structural design, vibration control, and aeroelastic tailoring by multiobjective optimization p 3739 N93-31137
Localization of aeroelastic modes in mistuned high-energy turbines p 3697 N93-31586
On the dynamics of aeroelastic oscillators with one degree of freedom
[REPT-92-96] p 3815 N93-31653

AERONAUTICAL ENGINEERING
Aeronautical engineering: A continuing bibliography with indexes (supplement 292)
[NASA-SP-7037(292)] p 3671 N93-32375

AERONAUTICS
Reynolds number influences in aeronautics
[NASA-TM-107730] p 3673 N93-31732

AEROSOLS
Aerosol optical properties of the free troposphere
[AD-A265795] p 3758 N93-31803
Investigation of atmospheric aerosols and gases at an east China station
[PB93-184539] p 3752 N93-31831

AEROSPACE ENGINEERING
An intelligent knowledge system for selection of materials for critical aerospace applications (IKSMAT), phase 2
[AD-A263394] p 3835 N93-31078
Modernization and new technologies: Coping with the information explosion
[NASA-TM-109410] p 3838 N93-31315
NASA-UVa light aerospace alloy and structure technology program supplement: Aluminum-based materials for high speed aircraft
[NASA-CR-4517] p 3705 N93-31643
NASA patent abstracts bibliography: A continuing bibliography. Section 1: Abstracts (supplement 43)
[NASA-SP-7039(43)-SECT-1] p 3839 N93-31923
NASA patent abstracts bibliography: A continuing bibliography. Section 2: Indexes (supplement 43)
[NASA-SP-7039(43)-SECT-2] p 3842 N93-32376
European aerospace science and technology, 1992: A bibliography with indexes
[NASA-SP-7105] p 3671 N93-32404

AEROSPACE ENVIRONMENTS
Prometheus in space: Survey report of Research Committee on Functional New Material p 3710 N93-31728
Protein requirements in hypoxia or hypokinesia p 3778 N93-32244

AEROSPACE INDUSTRY
French aerospace equipment p 3883 N93-31734
Automated Assembly Center (AAC) p 3686 N93-32123
Applications of structural optimization methods to fixed-wing aircraft and spacecraft in the 1980s
[NASA-TM-103939] p 3740 N93-32212

AEROSPACE MEDICINE
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 377)
[NASA-SP-7011(377)] p 3773 N93-31924
Nutrition, Metabolic Disorders and Lifestyle of Aircrew
[AGARD-CP-533] p 3777 N93-32240
Portable equipment developed to estimate energy expenditure by simultaneous recording of heart rate and body position p 3778 N93-32243
Protein requirements in hypoxia or hypokinesia p 3778 N93-32244
Idiopathic Reactive Hypoglycemia in a population of healthy trainees of an Italian Air Force military school p 3779 N93-32248
Lipidemic profile of Hellenic Airforce officers p 3774 N93-32250
Cardiovascular Risk Factors (CVRF) in Spanish pilots with coronary artery disease demonstrated by angiographic studies p 3775 N93-32253
Results and management of pathological lipoprotein concentrations and other cardiovascular risk factors in military pilots of the German Federal Armed Forces p 3775 N93-32254
The influence of dietary counseling and cardiac catheterization on lipid profiles in American military aviators p 3781 N93-32259
Changes in some lifestyle parametres in Norwegian pilots as students, and after 6 and 12 years of service p 3781 N93-32261
Survey of smoking habits in the Spanish Air Force p 3781 N93-32262
Health maintenance facility system effectiveness testing
[NASA-TM-104737] p 3783 N93-32328
Torsional vestibulo-ocular reflex measurements for identifying otolith asymmetries possibly related to space motion sickness susceptibility
[NASA-CR-193304] p 3774 N93-32364

AEROSPACE PLANES
Technology transfer: Potential of BMFT concept for hypersonics
[MBB-LME-202-S-PUB-0505] p 3843 N93-31045
Real-time trajectory optimization on parallel processors
[NASA-CR-193303] p 3795 N93-31640

AEROSPACE SAFETY
Airborne derivation of microburst alerts from ground-based Terminal Doppler Weather Radar information: A flight evaluation
[NASA-TM-108990] p 3680 N93-32223

AEROSPACE SCIENCES
Modernization and new technologies: Coping with the information explosion
[NASA-TM-109410] p 3838 N93-31315
The Israel Space Agency 1993 p 3883 N93-31590
The 1992 Langley Aerospace Research Summer Scholars (LARSS) program
[NASA-CR-193371] p 3833 N93-32229
European aerospace science and technology, 1992: A bibliography with indexes
[NASA-SP-7105] p 3671 N93-32404

AEROSPACE SYSTEMS
An intelligent knowledge system for selection of materials for critical aerospace applications (IKSMAT), phase 2
[AD-A263394] p 3835 N93-31078
NASA aerospace pyrotechnically actuated systems: Program plan
[NASA-TM-109226] p 3712 N93-31308
Workshop on Fuzzy Control Systems and Space Station Applications
[NASA-CR-193202] p 3688 N93-31439
Probabilistic load simulation: Code development status p 3694 N93-31564
Overview of the fatigue/fracture/life prediction working group program at the Lewis Research Center p 3696 N93-31574
A vision system planner for increasing the autonomy of the Extravehicular Activity Helper/Retriever
[NASA-CR-193301] p 3777 N93-31844
The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992)
[NASA-CP-3187-VOL-1] p 3883 N93-32097
DESSY: Making a real-time expert system robust and useful p 3794 N93-32146
Enhanced methods for determining operational capabilities and support costs of proposed space systems
[NASA-CR-193265] p 3812 N93-32350

AEROSPACE TECHNOLOGY TRANSFER
Technology transfer: Potential of BMFT concept for hypersonics
[MBB-LME-202-S-PUB-0505] p 3843 N93-31045

AEROSPACE VEHICLES
Mathematical simulation of the induced gamma-radiation in structural materials of spaceships
[DE93-606751] p 3688 N93-31076
Structural dynamics: Probabilistic structural analysis methods. Program overview p 3694 N93-31562
NASA-UVa light aerospace alloy and structure technology program supplement: Aluminum-based materials for high speed aircraft
[NASA-CR-4517] p 3705 N93-31643
Enhanced methods for determining operational capabilities and support costs of proposed space systems
[NASA-CR-193265] p 3812 N93-32350

AEROTHERMODYNAMICS
Overview of aerothermodynamic loads definition study p 3697 N93-31583

AFRICA
Central Africa: Global climate change and development
[PB93-179612] p 3768 N93-31871

AGING (METALLURGY)
Ageing aircraft research in the Netherlands
[NLR-TP-91443-U] p 3679 N93-32203

AIR CARGO
Longitudinal acceleration test of overhead luggage bins in a transport airframe section
[DOT/FAA/CT-92/9] p 3674 N93-31652

AIR CONDITIONING
International Energy Agency Solar Heating and Cooling Program
[DE93-010175] p 3750 N93-32282

Materials compatibility and lubricants research on CFC-refrigerant substitutes
[DE93-014770] p 3711 N93-32292

AIR COOLING
Measurements and computational analysis of heat transfer and flow in a simulated turbine blade internal cooling passage
[NASA-TM-106189] p 3725 N93-31647

AIR DATA SYSTEMS
Measurement uncertainties of the NCAR air motion systems
[PB93-184208] p 3764 N93-32068

AIR FILTERS
Biological treatment of porous off-gases
[VTT-JULK-766] p 3752 N93-31853

AIR FLOW
Measurement uncertainties of the NCAR air motion systems
[PB93-184208] p 3764 N93-32068

AIR JETS
Control of jet noise
[NASA-CR-193552] p 3816 N93-32221

AIR MASSES
Recent changes of weather patterns in North America
[DE93-013982] p 3769 N93-32289

AIR POLLUTION
Chemistry and acidity of cloud water at Mount Washington, NH
[PB93-190684] p 3767 N93-31206
Air quality studies in Albuquerque, New Mexico
[PB93-190817] p 3751 N93-31212
Two new gas standards programs at the National Institute of Standards and Technology
[PB93-191427] p 3751 N93-31816
Air Traffic and Environment
[GSF-BAND-8] p 3752 N93-31925
Climatic effects of harmful emissions from high altitude air traffic p 3752 N93-31926
Climatic effects of turbofan emissions in the stratosphere and the higher troposphere p 3753 N93-31927
Effects of commercial flight pollution on human health p 3753 N93-31931
Regional modeling analysis of the dependencies of atmospheric oxidants to perturbations in NOx and hydrocarbon emissions
[PB93-180925] p 3754 N93-32070
Making clean gasoline: The effect on jet fuels
[AD-A264302] p 3713 N93-32085
Methodology to apportion ambient air measurements to investigate potential effects on air quality near waste incinerators
[PB93-191393] p 3754 N93-32088
Proceedings: 1991 SO2 Control Symposium, volume 2, sessions 4 and 5A
[PB93-196103] p 3754 N93-32090
Proceedings: 1991 SO2 Control Symposium, volume 3, sessions 5B and 6
[PB93-196111] p 3755 N93-32091
Proceedings: 1991 SO2 Control Symposium, volume 4, session 7
[PB93-196129] p 3755 N93-32092
Proceedings: 1991 SO2 Control Symposium, volume 5, session 8
[PB93-196137] p 3755 N93-32093
Proceedings of the 1991 SO2 Control Symposium, volume 1
[PB93-196095] p 3755 N93-32168
Source apportionment of air pollution in China: Extending the usefulness of receptor modeling by combining multivariate and chemical mass balance models
[PB93-185726] p 3756 N93-32188
Relationships between ozone precursor levels and response to emissions reductions: Analysis of regional oxidant model results for the northeastern United States
[PB93-186294] p 3756 N93-32189
Atmospheric dispersion of air pollutants in Umea (Sweden)
[FOA-C-40300-4.5] p 3756 N93-32424

AIR PURIFICATION
Biological treatment of porous off-gases
[VTT-JULK-766] p 3752 N93-31853

AIR QUALITY
Environment and safety research
[PB93-188860] p 3751 N93-31142
Air quality studies in Albuquerque, New Mexico
[PB93-190817] p 3751 N93-31212
Making clean gasoline: The effect on jet fuels
[AD-A264302] p 3713 N93-32085
Methodology to apportion ambient air measurements to investigate potential effects on air quality near waste incinerators
[PB93-191393] p 3754 N93-32088
Proceedings: 1991 SO2 Control Symposium, volume 2, sessions 4 and 5A
[PB93-196103] p 3754 N93-32090
Proceedings: 1991 SO2 Control Symposium, volume 3, sessions 5B and 6
[PB93-196111] p 3755 N93-32091
Proceedings: 1991 SO2 Control Symposium, volume 4, session 7
[PB93-196129] p 3755 N93-32092
Proceedings: 1991 SO2 Control Symposium, volume 5, session 8
[PB93-196137] p 3755 N93-32093
Proceedings of the 1991 SO2 Control Symposium, volume 1
[PB93-196095] p 3755 N93-32168
Relationships between ozone precursor levels and response to emissions reductions: Analysis of regional oxidant model results for the northeastern United States
[PB93-186294] p 3756 N93-32189

AIR SAMPLING
Investigation of atmospheric aerosols and gases at an east China station
[PB93-184539] p 3752 N93-31831
Methodology to apportion ambient air measurements to investigate potential effects on air quality near waste incinerators
[PB93-191393] p 3754 N93-32088
Excitation rate and background measurements during LIF studies on krypton
[DE93-013500] p 3732 N93-32304

AIR TRAFFIC
Air Traffic and Environment
[GSF-BAND-8] p 3752 N93-31925

AIR TRAFFIC CONTROL
Flight test of avionic and air-traffic control systems
[ESA-TT-1279] p 3675 N93-31271
ATTAS experimental-cockpit and ATMOS for component and system investigations in flight guidance p 3676 N93-31276
Testing of an experimental FMS p 3676 N93-31277
Testing concept of a taxiing control system, summary p 3676 N93-31278
Aircraft accident report: Takeoff stall in icing conditions. USAir Flight 405, Fokker F-28, N485US, LaGuardia Airport, Flushing, New York, 22 March 1992
[PB93-910402] p 3674 N93-32195
UK airmisses involving commercial air transport, September - December 1991
[ETN-93-93930] p 3674 N93-32409
Evaluation of the flyability of MLS curved approaches for wide-body aircraft
[NLR-TP-91396-U] p 3680 N93-32416

AIR WATER INTERACTIONS
Global changes and the air-sea exchange of chemicals
[DE93-605636] p 3750 N93-31092
Navy tactical applications guide, part 2, volume 8: Arctic-East Siberian/Chukchi/Beaufort Seas. Weather analysis and forecast applications
[AD-A265585] p 3768 N93-31922
A numerical study of seasonal wind forcing effects on the California current system
[AD-A264951] p 3770 N93-32075
Polametric passive remote sensing of ocean surface
[AD-A265874] p 3746 N93-32173
A study of capillary and capillary-gravity wind waves: Their structures, distributions, and energy balances p 3771 N93-32215
Coupled ocean-atmosphere GCM simulation of Southern Oscillation phenomena
[DE93-012583] p 3766 N93-32297

AIRBORNE EQUIPMENT
Measurement uncertainties of the NCAR air motion systems
[PB93-184208] p 3764 N93-32068

AIRBORNE RADAR
Reconnaissance and deep-drill site selection on Taylor Dome, Antarctica p 3759 N93-31883

AIRBORNE/SPACEBORNE COMPUTERS
Advanced launch system multi-path redundant avionics architecture analysis and characterization
[NASA-CR-4516] p 3795 N93-31642
Advanced Transport Operating System (ATOPS) utility library software description
[NASA-CR-191469] p 3680 N93-32218

AIRCRAFT
Internation aircraft operator information system
[DOT/FAA/CT-93/4] p 3671 N93-32232

AIRCRAFT ACCIDENT INVESTIGATION
Aircraft accident report: Takeoff stall in icing conditions. USAir Flight 405, Fokker F-28, N485US, LaGuardia Airport, Flushing, New York, 22 March 1992
[PB93-910402] p 3674 N93-32195
Aircraft accident report: Controlled collision with terrain GP Express Airlines, Inc., Flight 861, a Beechcraft C99, N118GP, Anniston, Alabama, 8 June 1992
[PB93-910403] p 3674 N93-32196

AIRCRAFT ACCIDENTS
Reportable accidents to UK registered aircraft, and to foreign registered aircraft in UK airspace, 1990
[CAP-600] p 3674 N93-31730
Aircraft accident report: Takeoff stall in icing conditions. USAir Flight 405, Fokker F-28, N485US, LaGuardia Airport, Flushing, New York, 22 March 1992
[PB93-910402] p 3674 N93-32195
Aircraft accident report: Controlled collision with terrain GP Express Airlines, Inc., Flight 861, a Beechcraft C99, N118GP, Anniston, Alabama, 8 June 1992
[PB93-910403] p 3674 N93-32196

AIRCRAFT ANTENNAS
Installations and methods for measurement of aircraft radio components and systems p 3677 N93-31284

AIRCRAFT COMPARTMENTS
Longitudinal acceleration test of overhead luggage bins in a transport airframe section
[DOT/FAA/CT-92/9] p 3674 N93-31652

AIRCRAFT CONFIGURATIONS
Supersonic aerodynamic characteristics of an advanced F-16 derivative aircraft configuration
[NASA-TP-3355] p 3673 N93-31733

AIRCRAFT CONSTRUCTION MATERIALS
Aircraft structures in 2000: A technological challenge?
[MBB-LME-202-S-PUB-0485] p 3679 N93-31058
NASA-UVa light aerospace alloy and structure technology program supplement: Aluminum-based materials for high speed aircraft
[NASA-CR-4517] p 3705 N93-31643
Fatigue in single crystal nickel superalloys
[AD-A265451] p 3706 N93-31795

AIRCRAFT CONTROL
Low-speed wind tunnel study of the direct side-force characteristics of a joined-wing airplane with an upper fin
[DE93-767966] p 3672 N93-31189
Testing concept of a taxiing control system, summary p 3676 N93-31278
Design and implementation of fuzzy logic controllers
[NASA-CR-193268] p 3784 N93-31649

AIRCRAFT DESIGN
Aircraft structures in 2000: A technological challenge?
[MBB-LME-202-S-PUB-0485] p 3679 N93-31058
Computational methods for aerodynamic design of aircraft components
[NLR-TP-92072-4] p 3671 N93-31148
Definition of an airfoil family for the EUROFAR rotor
[DLR-FB-92-04] p 3679 N93-31197
Review of aerodynamic design in the Netherlands
[NLR-TP-91260-U] p 3679 N93-31840
Applications of structural optimization methods to fixed-wing aircraft and spacecraft in the 1980s
[NASA-TM-103939] p 3740 N93-32212
Selected experiments in laminar flow: An annotated bibliography
[NASA-TM-103989] p 3673 N93-32226
Civil tiltrotor transport point design: Model 940A
[NASA-CR-191446] p 3701 N93-32234
Panel methods for aerodynamic analysis and design
[NLR-TP-91404-U] p 3674 N93-32357
Analytical and experimental investigations of the oblique detonation wave engine concept
[NASA-TM-102839] p 3683 N93-32374

AIRCRAFT ENGINES
Blasim: A computational tool to assess ice impact damage on engine blades
[NASA-TM-106225] p 3740 N93-31193
Propulsion technology challenges for turn-of-the-century commercial aircraft
[NASA-TM-106192] p 3682 N93-32351
Analytical and experimental investigations of the oblique detonation wave engine concept
[NASA-TM-102839] p 3683 N93-32374

AIRCRAFT EQUIPMENT
The DLR test aircraft in the FZ-BS, -VFW 614/ATTAS, Dornier DO 228-101, MBB BO105 S-3 p 3675 N93-31272
French aerospace equipment p 3883 N93-31734

AIRCRAFT GUIDANCE
Aerial cartography using SICAD NAV-AIR p 3744 N93-31258
Flight evaluation of a computer aided low-altitude helicopter flight guidance system
[NASA-TM-103998] p 3678 N93-32225
A high-fidelity, six-degree-of-freedom batch simulation environment for tactical guidance research and evaluation
[NASA-TM-4440] p 3684 N93-32380

AIRCRAFT INDUSTRY
French aerospace equipment p 3883 N93-31734
Propulsion technology challenges for turn-of-the-century commercial aircraft
[NASA-TM-106192] p 3682 N93-32351

AIRCRAFT INSTRUMENTS
Pallet for helicopter test instrumentation p 3676 N93-31279

AIRCRAFT LANDING
Land subsidence and problems affecting land use at Edwards Air Force Base and vicinity, California, 1990 [PB93-182236] p 3765 N93-32191
AIRCRAFT MAINTENANCE
Performance of gas turbine compressor cleaners [NLR-TP-91237-U] p 3681 N93-31111
Ageing aircraft research in the Netherlands [NLR-TP-91443-U] p 3679 N93-32203
Damage severity of monitored fatigue load spectra [NLR-TP-92009-U] p 3679 N93-32205
AIRCRAFT MANEUVERS
Advanced aircraft with thrust vector control [MBB-FE-1-S-PUB-0504] p 3678 N93-31043
Tracking filters for precision Electronic Support Measures (ESM) systems [AD-A264089] p 3719 N93-31085
A high-fidelity, six-degree-of-freedom batch simulation environment for tactical guidance research and evaluation [NASA-TM-4440] p 3684 N93-32380
AIRCRAFT MODELS
Supersonic aerodynamic characteristics of an advanced F-16 derivative aircraft configuration [NASA-TP-3355] p 3673 N93-31733
AIRCRAFT NOISE
Engine technology challenges for a 21st Century High-Speed Civil Transport [NASA-TM-106216] p 3681 N93-31671
Effects on health of noise disturbances due to air traffic p 3753 N93-31929
Reaction to aircraft noise near general aviation airfields [DORA-8203] p 3817 N93-32377
Transmission of sound through a rotor [NLR-TP-92014-U] p 3683 N93-32386
AIRCRAFT PERFORMANCE
A high-fidelity, six-degree-of-freedom batch simulation environment for tactical guidance research and evaluation [NASA-TM-4440] p 3684 N93-32380
AIRCRAFT PILOTS
Abridged procedural guide to aircrew anthropometric accommodation assessment [AD-A265220] p 3777 N93-32006
Application and validation of workload assessment techniques [AD-A264575] p 3777 N93-32012
Nutritional assessment of United States tactical air command pilots p 3778 N93-32242
The lifestyle and dietary consumption patterns of United States Air Force aviators within air training command at Randolph Air Force Base, Texas p 3780 N93-32257
The influence of dietary counseling and cardiac catheterization on lipid profiles in American military aviators p 3781 N93-32259
Changes in some lifestyle parametres in Norwegian pilots as students, and after 6 and 12 years of service p 3781 N93-32261
The effects of cockpit heat on aviator sleep parameters p 3782 N93-32266
AIRCRAFT RELIABILITY
Ageing aircraft research in the Netherlands [NLR-TP-91443-U] p 3679 N93-32203
AIRCRAFT SAFETY
Longitudinal acceleration test of overhead luggage bins in a transport airframe section [DOT/FAA/CT-92/9] p 3674 N93-31652
Internation aircraft operator information system [DOT/FAA/CT-93/4] p 3671 N93-32232
UK airmisses involving commercial air transport, September - December 1991 [ETN-93-93930] p 3674 N93-32409
AIRCRAFT STRUCTURES
Consideration of impact damages by dimensioning CFC (Carbon Fiber Reinforced Composites) components [MBB-FE-221-S-PUB-0501] p 3699 N93-31044
Aircraft structures in 2000: A technological challenge? [MBB-LME-202-S-PUB-0485] p 3679 N93-31058
Computational methods for aerodynamic design of aircraft components [NLR-TP-92072-4] p 3671 N93-31148
NASA-UVA Light Aerospace Alloy and Structures Technology Program (LA2ST) [NASA-CR-193412] p 3706 N93-31739
AIRFIELD SURFACE MOVEMENTS
Testing concept of a taxiing control system, summary p 3676 N93-31278
AIRFOIL PROFILES
Computational methods for aerodynamic design of aircraft components [NLR-TP-92072-4] p 3671 N93-31148
AIRFOILS
Definition of an airfoil family for the EUROFAR rotor [DLR-FB-92-04] p 3679 N93-31197
The influence of variable flow velocity on unsteady airfoil behavior [DLR-FB-92-22] p 3672 N93-31320
Fatigue in single crystal nickel superalloys [AD-A265451] p 3706 N93-31795
Review of aerodynamic design in the Netherlands [NLR-TP-91260-U] p 3679 N93-31840
AIRGLOW
The effects of magnetic storm phases on F-layer irregularities from auroral to equatorial latitudes [AD-A264908] p 3764 N93-32094
AIRLINE OPERATIONS
Aircraft accident report: Takeoff stall in icing conditions. USAir Flight 405, Fokker F-28, N485US, LaGuardia Airport, Flushing, New York, 22 March 1992 [PB93-910402] p 3674 N93-32195
Aircraft accident report: Controlled collision with terrain GP Express Airlines, Inc., Flight 861, a Beechcraft C99, N118GP, Anniston, Alabama, 8 June 1992 [PB93-910403] p 3674 N93-32196
AIRPORTS
Effects of commercial flight pollution on human health p 3753 N93-31931
Effects of air traffic on nature and environment in the neighborhood of airports by example of the Munich 2 Airport (Germany) p 3753 N93-31932
AIRSHIPS
The International Stratospheric Laboratory for Astrophysics (ISLA): The cosmic microscope p 3846 N93-31765
ALBEDO
Systematic variations in the spectral properties of bright regions on Mars p 3864 N93-31951
ALERTNESS
Human factors and the safety of flights: The importance of the management of sleep p 3782 N93-32267
ALGAE
The diatom record from beneath the West Antarctic Ice Sheet and the global proxy perspective p 3759 N93-31882
ALGEBRA
Spatial relational algebra: An extended relational algebra for spatial database [REPT-92-051] p 3786 N93-31249
A generalized asymptoticity problem in max algebra, the general case [REPT-92-76] p 3804 N93-31471
An extended algorithm for performance evaluation of timed event graphs [REPT-92-75] p 3787 N93-31474
Information systems as coalgebras [ML-92-08] p 3838 N93-31481
Q-deformed conformal superalgebra and its Hopf subalgebras [DE93-608160] p 3807 N93-31808
On two-current realization of KP hierarchy [DE93-609917] p 3808 N93-31912
Linear algebra for signal processing [AD-A264677] p 3808 N93-32017
Conference: Three Decades of Numerical Linear Algebra at Berkeley [AD-A264964] p 3809 N93-32076
ALGORITHMS
Symposium on Applied Mathematical Programming and Modeling (APMOD93): Volume of extended abstracts [AD-A264091] p 3784 N93-31087
Scheduling data transfers in parallel computers and communications systems p 3836 N93-31132
Extracting projective information from single views of 3D point sets [OUEL-1927/92] p 3785 N93-31151
An efficient constrained predictive control algorithm for 2-input systems [OUEL-1946/92] p 3785 N93-31152
Least squares orthogonal polynomial approximation in several independent variables [DE93-609832] p 3802 N93-31180
ALGODESK: An experimental comparison of eight evolutionary heuristics applied to the QAP problem [REPT-92-052] p 3786 N93-31250
Towards a new approach to autonomous navigation for a vehicle: A link between probability data association filtering and the evidence theory [ONERA-NT-1990-11] p 3798 N93-31427
Curve interpolation with constrained length [MEMO-1079] p 3804 N93-31467
Optimal solutions to a two-block H infinity problem [MEMO-1080] p 3798 N93-31468
An extended algorithm for performance evaluation of timed event graphs [REPT-92-75] p 3787 N93-31474
Hybrid rendering of scientific data using an h-buffer [REPT-92-68] p 3788 N93-31495
Benchmark solutions for the incompressible Navier-Stokes equations in general coordinates on staggered grids [REPT-92-67] p 3724 N93-31496
The mechanization of lambda calculus [REPT-92-60] p 3805 N93-31499
Performance of scanline-oriented CSG direct display algorithms [REPT-93-03] p 3788 N93-31548
Structural reliability methods: Code development status p 3694 N93-31563
System reliability and risk assessment task goals and status p 3695 N93-31568
Probabilistic structural analysis algorithm development for computational efficiency p 3695 N93-31569
On the selection of an optimal set of secondary indices [MEMO-INF-92-68] p 3789 N93-31617
An ILU smoother for the incompressible Navier-Stokes equations in general coordinates [REPT-92-91] p 3725 N93-31634
A comparison of force control algorithms for robots in contact with flexible environments [NASA-CR-193251] p 3789 N93-31638
Primal-dual algorithms for linear programming based on the logarithmic barrier method [REPT-92-104] p 3790 N93-31659
VDM specification of the Secure Hash algorithm [NPL-DITC-212/92] p 3790 N93-31735
Linear algebra for signal processing [AD-A264677] p 3808 N93-32017
Benet improvements made on Los Alamos electromagnetic field code [AD-A265474] p 3718 N93-32065
Parametric and combinatorial problems in constrained optimization [AD-A265595] p 3792 N93-32096
Producing approximate answers to database queries p 3843 N93-32150
Mapping robust parallel multigrid algorithms to scalable memory architectures [NASA-CR-191470] p 3793 N93-32359
Global synchronization algorithms for the Intel iPSC/860 [NASA-CR-193618] p 3793 N93-32361
Introduction to natural algorithms [REPT-92-058] p 3793 N93-32391
Strategic control of reactive behavior in intelligent agents [AD-A264376] p 3801 N93-32413
ALIGNMENT
Neural nets for aligning optical components in harsh environments: Beam smoothing spatial filter as an example p 3693 N93-31557
Maglev guideway route alignment and right-of-way requirements [PB93-154854] p 3735 N93-31592
ALKALI METALS
Local order and concentration fluctuations in K-Pb and Rb-Pb alloys [DE93-606725] p 3704 N93-31093
Ion exchange polymers and method for making [NASA-CASE-LEW-15576-1] p 3709 N93-31316
ALKALINE EARTH METALS
Ion exchange polymers and method for making [NASA-CASE-LEW-15576-1] p 3709 N93-31316
ALKYL COMPOUNDS
The effect of alkyl substituents on the macrocycle ring on enantiomeric recognition by chiral pyridino-18-crown-6 for 1-naphthylethylamine [AD-A265513] p 3704 N93-31918
ALLOTROPY
Cyclocarbon coalescence: Mechanisms for tailormade fullerene formation [AD-A265489] p 3821 N93-31995
ALLOYING
Fatigue in single crystal nickel superalloys [AD-A265451] p 3706 N93-31795
Study on the improvement of the properties of Zr alloys [DE93-605265] p 3706 N93-31827
ALPHA DECAY
Nuclear structure effects in elastic and inelastic scattering of light ions [DE93-616909] p 3822 N93-32407
ALPHA PARTICLES
Solar wind heavy ions and proton/alpha particle relations observed onboard the Prognoz 7 satellite p 3879 N93-31414
ALPINE METEOROLOGY
Chemistry and acidity of cloud water at Mount Washington, NH [PB93-190684] p 3767 N93-31206

ALTERNATING CURRENT
Physical characterization and study of the electrical magnetic and thermal properties of the ceramic high Tc superconductor Y1Ba2Cu3O(7-x)
[DE92-640219] p 3711 N93-32187
ALUMINUM ALLOYS
High temperature, oxidation resistant noble metal-Al alloy thermocouple
[NASA-CASE-LEW-15515-1] p 3729 N93-31298
NASA-UVa light aerospace alloy and structure technology program supplement: Aluminum-based materials for high speed aircraft
[NASA-CR-4517] p 3705 N93-31643
Investigation of the electrochemical polarisation behaviour of SiC/6061 Al metal matrix composites
[NPL-DMM(A)-31] p 3700 N93-31736
Crack growth prediction models p 3682 N93-31747
Accelerated and real-time corrosion testing of aluminum-lithium alloys
[NLR-TP-91203-U] p 3707 N93-32385
ALUMINUM NITRIDES
Improved gallium nitride and aluminum nitride electronic materials
[AD-A264570] p 3710 N93-32010
ALUMINUM OXIDES
Thermal shock and fatigue behavior of ceramic tubes p 3739 N93-31139
Stress-rupture behavior of small diameter polycrystalline alumina fibers
[NASA-TM-106256] p 3712 N93-32382
AMERICAN INDIANS
Indigenous views of land and the environment
[PB93-186898] p 3755 N93-32166
AMERICIUM 241
Characterisation of a protection level Am-241 calibration source
[NPL-RSA(EXT)-35] p 3819 N93-31335
AMINES
Vibrational overtone spectroscopy of cyclic amines: Pyridine and related compounds
[AD-A265524] p 3704 N93-31919
AMINO ACIDS
Spontaneous regulating mechanisms that may have led to the origin of life
[DE93-603677] p 3771 N93-31161
AMMONIUM COMPOUNDS
Interactions between tetraalkylammonium ions and silicates
[ETN-93-94057] p 3703 N93-31622
AMMONIUM PERCHLORATES
The effect of alkyl substituents on the macrocycle ring on enantiomeric recognition by chiral pyridino-18-crown-6 for 1-naphthylethylamine
[AD-A265513] p 3704 N93-31918
AMORPHOUS MATERIALS
Large-area, triple-junction a-Si alloy production scale-up
[DE93-010007] p 3750 N93-32177
Structural characterization of nylon 7 by solid-state NMR, DSC, and ATR-FTIR
[AD-A265800] p 3822 N93-32312
AMORPHOUS SILICON
Large-area, triple-junction a-Si alloy production scale-up
[DE93-010007] p 3750 N93-32177
AMPLIFICATION
Tides of Massachusetts and Cape Cod Bays
[AD-A264790] p 3770 N93-31983
AMPLITUDE MODULATION
Auditory spectro-temporal pattern analysis
[AD-A264691] p 3773 N93-31981
AMPTE (SATELLITES)
An investigation of dayside FTE's observed by the AMPTE-UKS satellite p 3858 N93-31709
ANALOG TO DIGITAL CONVERTERS
Test measurements for quick analog digital converters for an x ray CCD camera
[ETN-93-94204] p 3728 N93-31119
GDF: A digitizing format for geographical data p 3744 N93-31260
Accuracy estimation for digitizing p 3745 N93-31265
ANALOGS
Reflectance spectroscopy and GEX simulation of palagonite and iron-rich montmorillonite clay mixtures: Implications for the surface composition of Mars p 3865 N93-31954
ANALYSIS (MATHEMATICS)
Symposium on Applied Mathematical Programming and Modeling (APMOD93): Volume of extended abstracts
[AD-A264091] p 3784 N93-31087
ANALYTIC FUNCTIONS
On the real symmetric inverse eigenvalue problem
[DE93-619667] p 3809 N93-32284
ANALYTICAL CHEMISTRY
Standard Reference Materials: Handbook for SRM users
[PB93-183796] p 3699 N93-31830
ANECHOIC CHAMBERS
Modal measurements and propeller field excitation on acoustic full scale mockup of SAAB 340 aircraft
[FFA-TN-1992-08] p 3815 N93-31051
ANEMIAS
Fundamental diagnostic hematology: Anemia (second edition)
[PB93-188662] p 3773 N93-31140
ANGIOGRAPHY
Cardiovascular Risk Factors (CVRF) in Spanish pilots with coronary artery disease demonstrated by angiographic studies p 3775 N93-32253
ANGLE OF ATTACK
Experiments in the control of wing rock at high angle of attack using tangential leading edge blowing p 3683 N93-31068
ANGULAR MOMENTUM
Nonlinear Pomeron and Odderon in elastic re-scatterings
[DE93-608326] p 3818 N93-31241
ANGULAR RESOLUTION
Prospects for stellar physics: Structure and influence of circumstellar media p 3850 N93-31789
ANISOTROPY
Mapping robust parallel multigrid algorithms to scalable memory architectures
[NASA-CR-191470] p 3793 N93-32359
ANNEALING
Investigation of carbon near the graphite-diamond-liquid triple point
[DE93-609052] p 3708 N93-31178
Use of titanium castings without a casting factor
[AD-A264414] p 3705 N93-31192
Si/SiO2 interface studies by immersion ellipsometry
[AD-A265151] p 3710 N93-31991
ANNOTATIONS
An annotated bibliography of research involving women, conducted at the US Army Research Institute of Environmental Medicine
[AD-A265497] p 3773 N93-31917
ANNUAL VARIATIONS
Mean seasonal cycles and interannual variations at 0 deg, 165 deg E during 1986-1992
[PB93-186195] p 3768 N93-31874
ANNULAR SUSPENSION AND POINTING SYSTEM
Large angle magnetic suspension test fixture
[NASA-CR-193123] p 3684 N93-31836
ANODES
Advanced alternate planar geometry solid oxide fuel cells
[DE93-000248] p 3721 N93-32174
ANODIZING
Evaluation of chemical conversion material (protective coating) exposed to space environmental conditions
[NASA-TM-108416] p 3730 N93-32366
ANOMALIES
An on-line expert system for diagnosing environmentally induced spacecraft anomalies using CLIPS p 3794 N93-32142
ANTARCTIC OCEAN
The diatom record from beneath the West Antarctic Ice Sheet and the global proxy perspective p 3759 N93-31882
ANTARCTIC REGIONS
The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop
[NASA-CP-3222] p 3758 N93-31878
Macrofossil records of West Antarctic Ice Sheet retreat during the Holocene p 3759 N93-31881
The diatom record from beneath the West Antarctic Ice Sheet and the global proxy perspective p 3759 N93-31882
Reconnaissance and deep-drill site selection on Taylor Dome, Antarctica p 3759 N93-31883
Irregular oscillations of the West Antarctic Ice Sheet p 3759 N93-31884
Radar studies of the West Antarctic ice streams p 3760 N93-31891
Airborne gravity and other geophysical techniques for understanding the lithosphere beneath the West Antarctic Ice Sheet p 3761 N93-31894
Aerogeophysical evidence for active volcanism beneath the West Antarctic Ice Sheet p 3761 N93-31895
Basal hydraulic conditions of Ice Stream B p 3762 N93-31898
In search of ice-stream sticky spots p 3762 N93-31899
Geologic controls on the West Antarctic Ice Sheet p 3762 N93-31900
Effect of subglacial volcanism on changes in the West Antarctic Ice Sheet p 3762 N93-31901
Sensible and latent heat flux estimates in Antarctica p 3763 N93-31902
Surface winds over West Antarctica p 3763 N93-31903
Modeling ice streams: Derived quantities p 3763 N93-31904
Field and laboratory investigations of Antarctic meteorites collected by United States expeditions, 1985-1987
[PB93-182723] p 3861 N93-32415
ANTENNA ARRAYS
Adaptive array processing in uncertain inhomogeneous media 1992-1993
[AD-A265256] p 3717 N93-31794
Efficient numerical techniques for the analysis of complex microstrip-antennas and microstrip-arrays
[ESA-TT-1259] p 3717 N93-31861
An investigation of the channel crosstalk in optical heterodyne controlled phased array radars
[AD-A265412] p 3717 N93-32046
ANTENNA DESIGN
Phased array for mobile satellite communications
[ESA-TT-1280] p 3716 N93-31342
The microwave radiometer as a remote sensing device: Design and application
[ISBN-9-09-005507-X] p 3746 N93-31537
Efficient numerical techniques for the analysis of complex microstrip-antennas and microstrip-arrays
[ESA-TT-1259] p 3717 N93-31861
ANTENNA RADIATION PATTERNS
Operation of the helicopter antenna radiation prediction code
[NASA-CR-193259] p 3715 N93-31110
ANTHROPOMETRY
An annotated bibliography of research involving women, conducted at the US Army Research Institute of Environmental Medicine
[AD-A265497] p 3773 N93-31917
Abridged procedural guide to aircrew anthropometric accommodation assessment
[AD-A265220] p 3777 N93-32006
Correlation of life-style and dietary concomitants of Greek pilots with serum analytes p 3780 N93-32256
ANTICYCLONES
Thermodynamic structure of subsidence inversions in the Atlantic subtropical anticyclone regime
[AD-A265406] p 3768 N93-32043
ANTIFERROMAGNETISM
Nonclassical disordered phase in the strong quantum limit of frustrated antiferromagnets
[DE92-645691] p 3815 N93-31806
ANTISUBMARINE WARFARE
Research platforms FLIP and ORB support
[AD-A265910] p 3771 N93-32320
APERTURES
Temperature dependence of the femtosecond optical response in doped high temperature superconductors
[DE93-009514] p 3829 N93-31988
APEXES
Smallest regular graphs with given diameter
[MEMO-1092] p 3810 N93-32399
APPLICATIONS PROGRAMS (COMPUTERS)
An intelligent knowledge system for selection of materials for critical aerospace applications (IKSMAT), phase 2
[AD-A263394] p 3835 N93-31078
HELAS: HELicity amplitude subroutines for Feynman diagram evaluations
[DE93-715538] p 3813 N93-31166
SCRIBO: An interactive grid-base name placement system for map making p 3745 N93-31268
Commercialization of NESSUS: Status p 3695 N93-31567
Orbit Analysis Tools Software user's manual, version 1
[AD-A265012] p 3686 N93-32081
Software engineering p 3794 N93-32154
Implementation of interconnect simulation tools in spice
[NASA-CR-193619] p 3792 N93-32239
APPROACH CONTROL
Evaluation of the flyability of MLS curved approaches for wide-body aircraft
[NLR-TP-91396-U] p 3680 N93-32416
APPROXIMATION
Least squares orthogonal polynomial approximation in several independent variables
[DE93-609832] p 3802 N93-31180
Curve interpolation with constrained length
[MEMO-1079] p 3804 N93-31467
Finite volume methods constructed by mixed variational formulation. Part 2: Error estimates in discrete energetic norms
[REPT-92-86] p 3805 N93-31488

Finite volume methods constructed by mixed variational formulation. Part 1: Description of the discretization technique
[REPT-92-85] p 3805 N93-31489
Approximation orders of and approximation maps from local principal shift-invariant spaces
[AD-A265038] p 3808 N93-31999
Finite-dimensional approximation for operator equations of Hammerstein type
[DE93-619669] p 3809 N93-32286
Convergence rates and finite-dimensional approximations for nonlinear ill-posed problems involving monotone operators in Banach spaces
[DE93-619670] p 3809 N93-32287

ARAMID FIBERS
Analysis of effective thermal conductivity of fibrous materials
[NASA-CR-193242] p 3709 N93-31636

ARCHITECTURE (COMPUTERS)
Testability of artificial neural networks: A behavioral approach
[REPT-92-047] p 3797 N93-31254
Evaluating master-slave implementation of double-dot parsing for massive parallel MIMD systems
[REPT-92-78] p 3794 N93-31473
Design and implementation strategies
[MEMO-INF-92-57] p 3788 N93-31511
Advanced launch system multi-path redundant avionics architecture analysis and characterization
[NASA-CR-4516] p 3795 N93-31642
The implementation of the digital wave processor for the ESA/NASA Cluster mission p 3858 N93-31708
Co-ordinated data handling for the UK participants in the Cluster mission p 3843 N93-31713
Current state of the mass storage system reference model p 3840 N93-31965
Grand challenges in mass storage: A system integrator's perspective p 3840 N93-31973
Performance of a distributed superscalar storage server p 3841 N93-31978
Architectural assessment of mass storage systems at GSFC p 3841 N93-31980
New architectures to reduce I/O bottlenecks in high-performance systems
[DE93-009059] p 3795 N93-31985
Neural attentional sensory processing
[AD-A265163] p 3799 N93-31992
Parametric and combinatorial problems in constrained optimization
[AD-A265595] p 3792 N93-32096
Video conferencing made easy
[DE93-010798] p 3718 N93-32283
Application of compiler-assisted multiple instruction rollback recovery to speculative execution
[NASA-CR-193360] p 3796 N93-32355
Strategic control of reactive behavior in intelligent agents
[AD-A264376] p 3801 N93-32413

ARCTIC REGIONS
Navy tactical applications guide, part 2, volume 8: Arctic-East Siberian/Chukchi/Beaufort Seas. Weather analysis and forecast applications
[AD-A265585] p 3768 N93-31922

ARITHMETIC
Realizability
[ML-92-09] p 3804 N93-31482

ARMED FORCES (UNITED STATES)
The Army and military in space
[AD-A264581] p 3812 N93-32013
RACE pulls for shared control p 3686 N93-32122

ARMOR
The development of a tungsten heavy alloy that fails by an adiabatic shear mechanism, phase 1
[AD-A265867] p 3707 N93-32318

ARRAYS
Striped tape arrays p 3730 N93-31970

ARTERIOSCLEROSIS
Cardiovascular risk factors in an Italian Air Force population: Preliminary report p 3775 N93-32252

ARTIFICIAL INTELLIGENCE
Commercial applications p 3688 N93-31441
NASA/ARC proposed training in intelligent control p 3688 N93-31444
Introduction to Fuzzy Set Theory p 3689 N93-31446
Advanced Artificial Intelligence Technology Testbed p 3801 N93-32126
Knowledge-based simulation using object-oriented programming p 3794 N93-32127
Crisis action planning and replanning using SIPE-2 p 3835 N93-32131
Agent oriented programming: An overview of the framework and summary of recent research p 3794 N93-32136
Intelligent assistance in scientific data preparation p 3843 N93-32144
PERTS: A Prototyping Environment for Real-Time Systems p 3794 N93-32147
The computer integrated documentation project: A merge of hypermedia and AI techniques p 3801 N93-32148
Automatic Target Recognition (ATR) using Distributed Associative Memories (DAMS)
[AD-A265613] p 3800 N93-32169
Strategic control of reactive behavior in intelligent agents
[AD-A264376] p 3801 N93-32413

ARTIFICIAL SATELLITES
A parametric analysis of endoatmospheric Low-Earth-Orbit maintenance
[AD-A265868] p 3685 N93-32319
Satellite motion around an oblate planet: A perturbation solution for all orbital parameters
[AD-A265779] p 3690 N93-32335

ASCORBIC ACID
Investigation of laser-induced retinal damage
[AD-A264096] p 3772 N93-31094

ASSEMBLING
DIAC at TWI
[REPT-92-77] p 3787 N93-31472

ASSOCIATIVE PROCESSING (COMPUTERS)
Automatic Target Recognition (ATR) using Distributed Associative Memories (DAMS)
[AD-A265613] p 3800 N93-32169

ASTEROIDS
Visible and infrared investigations of planet-crossing asteroids and outer solar system objects
[NASA-CR-193511] p 3844 N93-31604

ASTRODYNAMICS
Study of the second-order relativistic light deflection of the Sun using long-baseline fibre-linked interferometers: Laser-Interferometric Solar Relativity (LISOR) test p 3849 N93-31778

ASTROMETRY
Visible and infrared investigations of planet-crossing asteroids and outer solar system objects
[NASA-CR-193511] p 3844 N93-31604
The need of very accurate optical astrometry by interferometric techniques p 3844 N93-31751
Space-based astrometric optical interferometry with POINTS p 3845 N93-31758
Prospects for imaging and astrometry on the ground and implications for space interferometry p 3848 N93-31776
Study of the second-order relativistic light deflection of the Sun using long-baseline fibre-linked interferometers: Laser-Interferometric Solar Relativity (LISOR) test p 3849 N93-31778
Interferometer concepts for astrometry in space p 3691 N93-31788

ASTRONAUT TRAINING
Background and objectives of the PARAT program p 3775 N93-31230

ASTRONAUTICS
European aerospace science and technology, 1992: A bibliography with indexes
[NASA-SP-7105] p 3671 N93-32404

ASTRONOMICAL CATALOGS
Using machine learning techniques to automate sky survey catalog generation p 3843 N93-32143

ASTRONOMICAL INTERFEROMETRY
Targets for Space-Based Interferometry
[ESA-SP-354] p 3844 N93-31750
The need of very accurate optical astrometry by interferometric techniques p 3844 N93-31751
Ultraviolet imaging interferometry p 3844 N93-31752
Visible and infrared imaging interferometry from space p 3844 N93-31753
Submillimeter interferometry p 3845 N93-31754
Prospects for Earth-based interferometry p 3845 N93-31755
Comparative aspects of Earth- and space-based interferometry p 3845 N93-31756
Interferometry from the Moon p 3845 N93-31757
Space-based astrometric optical interferometry with POINTS p 3845 N93-31758
The SUN/SIMURIS interferometer p 3845 N93-31759
Space Interferometry Science Working Group p 3846 N93-31761
Report on the ESA Interferometry Study Team activities p 3846 N93-31762
The VLT interferometer: Current status and expectations for the next 20 years p 3846 N93-31763
SISTERS: A space interferometer for the search for terrestrial exo-planets by rotation shearing p 3846 N93-31764
Imaging circumstellar disks around young stars by multi-aperture interferometry p 3847 N93-31766
Study of ISM turbulence using radiointerferometers (new method) p 3847 N93-31767
The lunar interferometer for solar physics p 3847 N93-31768
Advanced lunar-based interferometer for solar observations p 3847 N93-31769
Report of the submillimeter splinter group p 3847 N93-31770
Atomic and molecular line observations of galaxies p 3847 N93-31771
Submillimetre line observations of molecular clouds p 3848 N93-31772
Summary of the splinter session on optical and UV science p 3848 N93-31773
UV interferometry of hot stars p 3848 N93-31774
High resolution solar physics p 3848 N93-31775
Prospects for imaging and astrometry on the ground and implications for space interferometry p 3848 N93-31776
P Cyg envelope and prospects of interferometric observations p 3848 N93-31777
Study of the second-order relativistic light deflection of the Sun using long-baseline fibre-linked interferometers: Laser-Interferometric Solar Relativity (LISOR) test p 3849 N93-31778
Spectro-imagery with a Rotating Slip-Aperture Telescope (RSAT): Cophasing successive projections in the radon plane p 3849 N93-31779
Study of an optimized configuration for interferometric imaging of complex and extended solar structures p 3849 N93-31780
High resolution imaging from the ground using a satellite-borne laser guide star p 3849 N93-31781
Exploring the limits of adaptive wavefront compensation for ground based astronomical interferometers p 3849 N93-31782
Integrated optics for an interferometric link p 3824 N93-31783
IR single-mode fiber optics for double Fourier interferometry p 3824 N93-31784
Interferometry at the vacuum ultra-violet limit p 3850 N93-31785
HARDI: A High Angular Resolution Deployable Interferometer p 3850 N93-31786
A concept of deployable tethered interferometer p 3691 N93-31787
Interferometer concepts for astrometry in space p 3691 N93-31788
Prospects for stellar physics: Structure and influence of circumstellar media p 3850 N93-31789

ASTRONOMICAL MODELS
Predicting Ly-alpha intensities in coronal streamers p 3870 N93-31360
Static and dynamic loop models and their observational signatures p 3873 N93-31377
Temperature measurements in the inner corona p 3877 N93-31402
Magnetic field reconnection at the dayside magnetopause p 3855 N93-31696
Model of a rotating magnetic cloud p 3857 N93-31707

ASTRONOMICAL OBSERVATORIES
Targets for Space-Based Interferometry
[ESA-SP-354] p 3844 N93-31750
The International Stratospheric Laboratory for Astrophysics (ISLA): The cosmic microscope p 3846 N93-31765
Report of the submillimeter splinter group p 3847 N93-31770
The application of synthetic-beacon technology to astronomy
[AD-A265146] p 3850 N93-31990

ASTRONOMICAL PHOTOGRAPHY
The solar corona structures as inferred from July 11, 1991 total solar eclipse observation p 3872 N93-31372
The July 11, 1991 solar corona observed in polarized white light: Preliminary results p 3879 N93-31417
Using machine learning techniques to automate sky survey catalog generation p 3843 N93-32143

ASTRONOMICAL POLARIMETRY
Development of a large field-of-view KD potassium di-deuterium phosphate modulator: Center Director's Discretionary Fund
[NASA-TM-108410] p 3824 N93-32378

ASTRONOMICAL SPECTROSCOPY
Submillimetre line observations of molecular clouds p 3848 N93-31772

ASTROPHYSICS
Distributed data systems in space physics p 3859 N93-31715

ASYMMETRY
Torsional vestibulo-ocular reflex measurements for identifying otolith asymmetries possibly related to space motion sickness susceptibility
[NASA-CR-193304] p 3774 N93-32364

ASYMPTOTIC METHODS
The conditions leading to intense low frequency generation and strong localization in two level systems
[AD-A265110] p 3819 N93-31791
ASYMPTOTIC PROPERTIES
A generalized asymptoticity problem in max algebra, the general case
[REPT-92-76] p 3804 N93-31471
ASYMPTOTIC SERIES
Effect of sound on boundary layer stability
[NASA-CR-193367] p 3816 N93-32238
ATLANTIC OCEAN
Hydrographic observations in the western tropical and subtropical North Atlantic Ocean: Atlantic Climate Change Program (ACCP) and Western Tropical Atlantic Experiment (WESTRAX) during 1991
[PB93-184778] p 3770 N93-31832
Thermodynamic structure of subsidence inversions in the Atlantic subtropical anticyclone regime
[AD-A265406] p 3768 N93-32043
ATMOSPHERIC BOUNDARY LAYER
Wind profiling in a cloudy convective atmospheric boundary layer over land
[AD-A265422] p 3768 N93-32051
ATMOSPHERIC CHEMISTRY
Climatic effects of harmful emissions from high altitude air traffic p 3752 N93-31926
Climatic effects of turbofan emissions in the stratosphere and the higher troposphere p 3753 N93-31927
MSATT Workshop on Chemical Weathering on Mars
[NASA-CR-193209] p 3861 N93-31933
Regional modeling analysis of the dependencies of atmospheric oxidants to perturbations in NOx and hydrocarbon emissions
[PB93-180925] p 3754 N93-32070
Source apportionment of air pollution in China: Extending the usefulness of receptor modeling by combining multivariate and chemical mass balance models
[PB93-185726] p 3756 N93-32188
Relationships between ozone precursor levels and response to emissions reductions: Analysis of regional oxidant model results for the northeastern United States
[PB93-186294] p 3756 N93-32189
Refine research plan for use of Atlas data
[NASA-CR-192611] p 3766 N93-32349
ATMOSPHERIC CIRCULATION
Global changes and the air-sea exchange of chemicals
[DE93-605636] p 3750 N93-31092
U.S. National weather experiment STORM-FEST 1992: Wave and turbulence in frontal zones
[AD-A264294] p 3766 N93-31182
Thermodynamic structure of subsidence inversions in the Atlantic subtropical anticyclone regime
[AD-A265406] p 3768 N93-32043
Wind profiling in a cloudy convective atmospheric boundary layer over land
[AD-A265422] p 3768 N93-32051
Evolution of area-averaged vertical velocity in the convective region of a midlatitude squall line
[AD-A265333] p 3768 N93-32063
Recent changes of weather patterns in North America
[DE93-013982] p 3769 N93-32289
ATMOSPHERIC COMPOSITION
Global changes and the air-sea exchange of chemicals
[DE93-605636] p 3750 N93-31092
Air quality studies in Albuquerque, New Mexico
[PB93-190817] p 3751 N93-31212
Investigation of atmospheric aerosols and gases at an east China station
[PB93-184539] p 3752 N93-31831
Calculated mineral precipitation upon evaporation of a model Martian groundwater near 0 C p 3862 N93-31940
Implications of isotopic compositions of N and Ne in the Martian atmosphere to temporal evolution of its atmosphere and regolith p 3864 N93-31947
Mars brine formation experiment p 3864 N93-31949
Source apportionment of air pollution in China: Extending the usefulness of receptor modeling by combining multivariate and chemical mass balance models
[PB93-185726] p 3756 N93-32188
Refine research plan for use of Atlas data
[NASA-CR-192611] p 3766 N93-32349
ATMOSPHERIC DENSITY
U.S. National weather experiment STORM-FEST 1992: Wave and turbulence in frontal zones
[AD-A264294] p 3766 N93-31182
ATMOSPHERIC DIFFUSION
Integration of measurements with atmospheric dispersion models: Source term estimation for dispersal of (239)Pu due to non-nuclear detonation of high explosive
[DE93-012550] p 3766 N93-32295
Atmospheric dispersion of air pollutants in Umea (Sweden)
[FOA-C-40300-4.5] p 3756 N93-32424
ATMOSPHERIC GENERAL CIRCULATION MODELS
Recent changes of weather patterns in North America
[DE93-013982] p 3769 N93-32289
Coupled ocean-atmosphere GCM simulation of Southern Oscillation phenomena
[DE93-012583] p 3766 N93-32297
ATMOSPHERIC MODELS
An investigation of methods for improving models of ionospheric plasma-density irregularities and radio-frequency scintillation
[AD-A264156] p 3756 N93-31062
Advances in dynamical predictions and modelling of tropical cyclone motion
[AD-A264500] p 3767 N93-31195
GCM control run of UK Meteorological Office compared with the real climate in the NW European winter
[KNMI-WR-92-02] p 3767 N93-31601
The structure of the dayside boundary layer between the Venus ionosphere and the shocked solar wind p 3853 N93-31678
Source apportionment of air pollution in China: Extending the usefulness of receptor modeling by combining multivariate and chemical mass balance models
[PB93-185726] p 3756 N93-32188
Numerical modelling of mesoscale atmospheric dispersion, volumes 1 and 2 p 3765 N93-32217
Refine research plan for use of Atlas data
[NASA-CR-192611] p 3766 N93-32349
ATMOSPHERIC MOISTURE
Chemistry and acidity of cloud water at Mount Washington, NH
[PB93-190684] p 3767 N93-31206
ATMOSPHERIC PHYSICS
The effects of magnetic storm phases on F-layer irregularities from auroral to equatorial latitudes
[AD-A264908] p 3764 N93-32094
ATMOSPHERIC PRESSURE
Effect of purity on adsorption capacities of a Mars-like clay mineral at different pressures p 3863 N93-31945
ATMOSPHERIC REFRACTION
Aerosol optical properties of the free troposphere
[AD-A265795] p 3758 N93-31803
ATMOSPHERIC SCATTERING
Scattering by irregular particles in anomalous diffraction and discrete dipole approximations p 3817 N93-31154
Mathematical inversion of multiple-scattering of laser light
[DE93-609128] p 3803 N93-31224
Aerosol optical properties of the free troposphere
[AD-A265795] p 3758 N93-31803
ATMOSPHERIC SOUNDING
Aerosol optical properties of the free troposphere
[AD-A265795] p 3758 N93-31803
Theory and application of a Radio-Acoustic Sounding System (RASS)
[PB93-191252] p 3769 N93-31815
Determination of the robustness of passive microwave measurements and derivative parameters for use in precipitation discrimination over land
[AD-A265492] p 3768 N93-32008
ATMOSPHERIC TEMPERATURE
Theory and application of a Radio-Acoustic Sounding System (RASS)
[PB93-191252] p 3769 N93-31815
Sensible and latent heat flux estimates in Antarctica p 3763 N93-31902
Recent changes of weather patterns in North America
[DE93-013982] p 3769 N93-32289
Atmospheric dispersion of air pollutants in Umea (Sweden)
[FOA-C-40300-4.5] p 3756 N93-32424
ATMOSPHERIC TURBULENCE
The application of synthetic-beacon technology to astronomy
[AD-A265146] p 3850 N93-31990
An acoustic scattering code
[AD-A265863] p 3816 N93-32316
ATOMIC COLLISIONS
Excitation of atomic hydrogen
[DE93-604639] p 3820 N93-31822
Theoretical investigation of electron-positive ion/atom interactions
[DE93-012933] p 3822 N93-32162
Geometric model from microscopic theory for nuclear absorption
[NASA-TP-3324] p 3822 N93-32369
ATOMIC EXCITATIONS
Effects of atomic coherence on multi-level lasing systems p 3731 N93-31133
Excitation rate and background measurements during LIF studies on krypton
[DE93-013500] p 3732 N93-32304
ATOMIC PHYSICS
Proceedings of the Workshop on Spin-Charge Transfer Reaction in Atomic Collision Process for planning of next period of cascade project
[DE93-704290] p 3821 N93-31834
Improved gallium nitride and aluminum nitride electronic materials
[AD-A264570] p 3710 N93-32010
ATOMIC SPECTRA
Quantum spectra and dynamics p 3831 N93-31129
Atomic and molecular line observations of galaxies p 3847 N93-31771
An analysis of the composition of auroral emissions in the near infrared
[AD-A265493] p 3764 N93-32009
ATOMIC STRUCTURE
Metastability in molecules
[AD-A264344] p 3817 N93-31063
ATOMIC WEIGHTS
Proposal for an absolute, atomic definition of mass
[DE93-609842] p 3815 N93-32410
ATOMS
Si atomic layer epitaxy based on Si2H6 and remote He plasma bombardment
[DE93-011674] p 3830 N93-32183
ATTITUDE (INCLINATION)
The aircraft position tests: A computer generated process for acquisition of spatial orientation capability p 3776 N93-31236
ATTITUDE CONTROL
Space Station Freedom attitude determination and control system overview p 3689 N93-31447
Blowdown thrust profile prediction p 3689 N93-31448
Fuzzy based attitude controller for flexible spacecraft with on/off thrusters
[NASA-CR-188250] p 3690 N93-32228
ATTITUDE INDICATORS
Space Station Freedom attitude determination and control system overview p 3689 N93-31447
AUDITORY PERCEPTION
The clearance test: A computer generated process for acquisition of auditive short term sensitivity p 3776 N93-31234
Auditory spectro-temporal pattern analysis
[AD-A264691] p 3773 N93-31981
AUDITORY SIGNALS
Auditory spectro-temporal pattern analysis
[AD-A264691] p 3773 N93-31981
AURORA 7
Auroral Cluster: Science objectives and measurement strategies p 3858 N93-31710
AURORAL ELECTROJETS
On the solar wind-magnetosphere-ionosphere coupling: AMPTE/CCE particle data and the AE indices p 3856 N93-31701
AURORAL ZONES
Investigation of fine-scale aurora with the Freja electric field instrument p 3860 N93-31719
The effects of magnetic storm phases on F-layer irregularities from auroral to equatorial latitudes
[AD-A264908] p 3764 N93-32094
AURORAS
Investigation of fine-scale aurora with the Freja electric field instrument p 3860 N93-31719
An analysis of the composition of auroral emissions in the near infrared
[AD-A265493] p 3764 N93-32009
AUSTENITIC STAINLESS STEELS
Detection of radiation-induced changes in electrochemical properties of austenitic stainless steels using miniaturized specimens and the single-loop electrochemical potentiokinetic reactivation method
[DE93-012865] p 3707 N93-32302
AUTOCORRELATION
GCM control run of UK Meteorological Office compared with the real climate in the NW European winter
[KNMI-WR-92-02] p 3767 N93-31601
AUTOMATA THEORY
Tapes, queues and communicating automata in DIAC
[REPT-92-94] p 3789 N93-31631
AUTOMATED TRANSIT VEHICLES
GDF: A digitizing format for geographical data p 3744 N93-31260
The use of digital road data by a navigation system p 3678 N93-31269
Maglev guideway and route integrity requirements
[PB93-154870] p 3736 N93-32086
AUTOMATIC CONTROL
A framework for spatio-temporal control in the tracking of visual contours
[OUEL-1961/92] p 3785 N93-31055
Fuzzy Control/Space Station automation p 3688 N93-31440
Commercial applications p 3688 N93-31441

Current projects in Fuzzy Control
p 3688 N93-31442
Neural nets for aligning optical components in harsh environments: Beam smoothing spatial filter as an example p 3693 N93-31557
A vision system planner for increasing the autonomy of the Extravehicular Activity Helper/Retriever
|NASA-CR-193301| p 3777 N93-31844
Supervisory autonomous local-remote control system design: Near-term and far-term applications
p 3801 N93-32100
Automatic Target Recognition (ATR) using Distributed Associative Memories (DAMS)
|AD-A265613| p 3800 N93-32169

AUTOMATIC FLIGHT CONTROL
Development and flight testing of a fault-tolerant fly-by-light yaw control system p 3676 N93-31280

AUTOMATIC PILOTS
A high-fidelity, six-degree-of-freedom batch simulation environment for tactical guidance research and evaluation
|NASA-TM-4440| p 3684 N93-32380

AUTOMATION
Selection by simulation: A work sample approach to the selection of process algebras
|ISBN-9-09-005483-9| p 3811 N93-31618
Striped tape arrays p 3730 N93-31970
The enhanced Software Life Cyle Support Environment (ProSLCSE): Automation for enterprise and process modeling p 3794 N93-32158
Ground Robotic Hand Applications for the Space Program study (GRASP)
|NASA-CR-193571| p 3737 N93-32235

AUTOMOBILE ENGINES
Spray characteristics of two types of fuel injectors
|PB93-180859| p 3736 N93-32069

AUTOMOBILE FUELS
Cost-effectiveness analysis of txDOT LPG fleet conversion, volume 1
|PB93-186492| p 3712 N93-31326
Cost-effectiveness analysis of txDOT LPG fleet conversion, volume 2
|PB93-186500| p 3713 N93-31327

AUTOMORPHISMS
Most monothetic extensions are rank-1
|REPT-93-05| p 3813 N93-31546

AUTONOMOUS NAVIGATION
The use of digital road data by a navigation system
p 3678 N93-31269
Towards a new approach to autonomous navigation for a vehicle: A link between probability data association filtering and the evidence theory
|ONERA-NT-1990-11| p 3798 N93-31427
The effect of sensory input on trajectories generated by recurrent neural networks
|AD-A264501| p 3799 N93-32036
Stanford Aerospace Research Laboratory research overview p 3690 N93-32103
Real-time qualitative reasoning for telerobotic systems
p 3737 N93-32116

AUTONOMY
Interactive and cooperative sensing and control for advanced teleoperation p 3784 N93-32108
Air Force construction automation/robotics
p 3715 N93-32110
RACE pulls for shared control p 3686 N93-32122
An overview of the Kennedy Space Center robotics program p 3691 N93-32124

AVERAGE
Tidally averaged models for dispersion in shallow water
|REPT-92-66| p 3769 N93-31497

AVIATION METEOROLOGY
Preliminary evaluation of aviation-impact variables derived from numerical models
|PB93-190197| p 3767 N93-31202

AVIATION PSYCHOLOGY
Computer-generated parallel tests for aptitude measurement in the selection of aviation operators
|DLR-FB-92-29| p 3775 N93-31229
The test memorization of symbols and numbers: A computer generated test for visual sensitivity
p 3775 N93-31233
The clearance test: A computer generated process for acquisition of auditive short term sensitivity
p 3776 N93-31234
The concentration loading test system: A computer generated process for acquisition of attentiveness control p 3776 N93-31235
The aircraft position tests: A computer generated process for acquisition of spatial orientation capability
p 3776 N93-31236
The cube rotation test: A computer generated process for acquisition of mental spatial manipulator capability
p 3776 N93-31237
The PARAT tests as examination system
p 3776 N93-31238

AVIONICS
Flight test of avionic and air-traffic control systems
|ESA-TT-1279| p 3675 N93-31271
Instigation and processing of flight tests in DLR
p 3675 N93-31275
Advanced launch system multi-path redundant avionics architecture analysis and characterization
|NASA-CR-4516| p 3795 N93-31642

AXIAL FLOW TURBINES
The ViB-code to simulate 3-D stator/rotor flow in axial turbines
|DLR-FB-92-19| p 3681 N93-31170
Penn State axial flow turbine facility: Performance and nozzle flow field p 3698 N93-31588

AXIAL LOADS
Lubrication of an 85-mm ball bearing with RP-1
|NASA-TM-106254| p 3686 N93-31670

AXISYMMETRIC FLOW
Numerical simulation of the flow in a 1:57-scale axisymmetric model of a large blast simulator
|AD-A265551| p 3685 N93-31916
An incompressible axisymmetric through-flow calculation procedure for design and off-design analysis of turbomachinery
|AD-A264933| p 3726 N93-32071

B

B STARS
Frequency of the chemical elements in B-stars of the local field and dispersion of interstellar medium
|ETN-93-94205| p 3852 N93-31091
Spectral classification with the International Ultraviolet Explorer: An atlas of B-type spectra
|NASA-RP-1312| p 3861 N93-31737

BACKSCATTERING
Evaluation of chemical conversion material (protective coating) exposed to space environmental conditions
|NASA-TM-108416| p 3730 N93-32366

BACKWARD FACING STEPS
Numerical simulations of three-dimensional laminar flow over a backward facing step; flow near side walls
|NASA-TM-106248| p 3723 N93-31147
A critical comparison of several low Reynolds number k-epsilon turbulence models for flow over a backward facing step
|NASA-TM-106173| p 3809 N93-32200

BACTERIA
Microbiological test results of the environmental control and life support systems vapors compression distillation subsystem recycle tank components following various pretreatment protocols
|NASA-CR-192570| p 3772 N93-32354
Optimization of 15 parameters influencing the long-term survival of bacteria in aquatic systems
|NASA-CR-192571| p 3772 N93-32365

BAGGAGE
Longitudinal acceleration test of overhead luggage bins in a transport airframe section
|DOT/FAA/CT-92/9| p 3674 N93-31652

BAKELITE (TRADEMARK)
Molecular dynamical and structural studies for the bakelite by neutron cross section measurements
|DE93-609444| p 3819 N93-31244

BALANCE
The mass balance of the ice plain of Ice Stream B and Crary Ice Rise p 3760 N93-31888

BALL BEARINGS
Lubrication of an 85-mm ball bearing with RP-1
|NASA-TM-106254| p 3686 N93-31670

BALLOON SOUNDING
Aerosol optical properties of the free troposphere
|AD-A265795| p 3758 N93-31803

BALLOON-BORNE INSTRUMENTS
The International Stratospheric Laboratory for Astrophysics (ISLA): The cosmic microscope
p 3846 N93-31765

BANACH SPACE
Existence of viable solutions for nonconvex-valued differential inclusions in Banach spaces
|DE92-644669| p 3803 N93-31285
Optimal control problems for parabolic boundary control systems p 3800 N93-32216
Finite-dimensional approximation for operator equations of Hammerstein type
|DE93-619669| p 3809 N93-32286
Convergence rates and finite-dimensional approximations for nonlinear ill-posed problems involving monotone operators in Banach spaces
|DE93-619670| p 3809 N93-32287

BAND STRUCTURE OF SOLIDS
Light-induced band-structure modifications in modulation-doped 3-5 semiconductor heterostructures
|ETN-93-94053| p 3828 N93-31619

BANDPASS FILTERS
Synthesis and realization of a monolithic active bandpass filter for the Ku band
|LAAS-92365| p 3719 N93-31173

BARIUM ION CLOUDS
One-dimensional numerical simulations of the low-frequency electric fields in the CRIT1 and CRIT2 rocket experiments
|TRITA-ALP-1992-01| p 3758 N93-31625

BAROCLINITY
Advances in dynamical predictions and modelling of tropical cyclone motion
|AD-A264500| p 3767 N93-31195

BAROTROPISM
Advances in dynamical predictions and modelling of tropical cyclone motion
|AD-A264500| p 3767 N93-31195

BARYON RESONANCE
Some outstanding issues in pion scattering at energies above the (delta) resonance
|DE93-012747| p 3822 N93-32300

BASALT
The fate of iron on Mars: Mechanism of oxidation of basaltic minerals to ferric-bearing assemblages
p 3862 N93-31938
Location of nanophase Fe-oxides in palagonitic soils: Implication for Martian pigments p 3863 N93-31943
Preliminary results of an experimental study of the interactions of basalt glass and a water vapor atmosphere: Implications for weathering on Mars
p 3864 N93-31948
Systematic variations in the spectral properties of bright regions on Mars p 3864 N93-31951
Infrared optical properties of Mars soil analog materials: Palagonites p 3866 N93-31957

BATHYMETERS
Tides of Massachusetts and Cape Cod Bays
|AD-A264790| p 3770 N93-31983

BAYES THEOREM
Statistical and numerical methods in control and identification
|AD-A264676| p 3811 N93-32016
Decision theory for computing variable and value ordering decisions for scheduling problems
p 3835 N93-32137

BAYS (TOPOGRAPHIC FEATURES)
Variability of temperature and salinity in the Middle Atlantic Bight and Gulf of Maine
|PB93-174019| p 3769 N93-31591

BCS THEORY
BCS universal constants for high-temperature superconductivity
|DE92-642079| p 3830 N93-32405

BEACONS
The application of synthetic-beacon technology to astronomy
|AD-A265146| p 3850 N93-31990

BEAMFORMING
Neural attentional sensory processing
|AD-A265163| p 3799 N93-31992

BEARING (DIRECTION)
Tracking filters for precision Electronic Support Measures (ESM) systems
|AD-A264089| p 3719 N93-31085

BEARINGS
Design review of fluid film bearing testers
|NASA-CR-193299| p 3735 N93-31731

BEDROCK
In search of ice-stream sticky spots
p 3762 N93-31899
Chemical transport during formation and alteration of Martian impact and volcanic deposits
p 3865 N93-31953

BENDING FATIGUE
Design of multiple-ply laminated composite tapered beams
|NASA-TM-108411| p 3700 N93-31650

BENDING VIBRATION
Sensitivity analysis of coupled bending and torsional vibrations in flexible robot arms
|MEMO-1088| p 3735 N93-31526
Excitation by flows in seals and clearances. Part 1: Introduction: Fluid-structure-interactions in rotordynamics. Part 2: Identification of rotordynamic coefficients of annular seals p 3738 N93-32275

BENZENE
Vibrational overtone spectroscopy of cyclic amines: Pyridine and related compounds
|AD-A265524| p 3704 N93-31919

BERNSTEIN ENERGY PRINCIPLE
On the Bernstein modes generation in solar post-flare loops p 3859 N93-31718

BIBLIOGRAPHIES
An annotated bibliography of inductive learning since 1985
| REPT-92-74 | p 3833 N93-31507
An annotated bibliography of research involving women, conducted at the US Army Research Institute of Environmental Medicine
| AD-A265497 | p 3773 N93-31917
NASA patent abstracts bibliography: A continuing bibliography. Section 1: Abstracts (supplement 43)
| NASA-SP-7039(43)-SECT-1 | p 3839 N93-31923
Selected experiments in laminar flow: An annotated bibliography
| NASA-TM-103989 | p 3673 N93-32226
NASA patent abstracts bibliography: A continuing bibliography. Section 2: Indexes (supplement 43)
| NASA-SP-7039(43)-SECT-2 | p 3842 N93-32376
European aerospace science and technology, 1992: A bibliography with indexes
| NASA-SP-7105 | p 3671 N93-32404

BIHARMONIC EQUATIONS
Biharmonic pattern selection
| DE93-608186 | p 3803 N93-31303

BINARY ALLOYS
Local order and concentration fluctuations in K-Pb and Rb-Pb alloys
| DE93-606725 | p 3704 N93-31093

BINARY DATA
Neural network identification of keystream generators
| AD-A265778 | p 3800 N93-32334

BINARY SYSTEMS (MATERIALS)
Numerical evidence for two types of localized states in a two-dimensional disordered lattice
| DE92-642677 | p 3827 N93-31159

BIOCHEMISTRY
Spontaneous regulating mechanisms that may have led to the origin of life
| DE93-603677 | p 3771 N93-31161

BIODEGRADATION
Geochemical, genetic, and physiological control of pollutant biodegradation
| AD-A264106 | p 3753 N93-32027
In-situ bioventing: Two US EPA and Air Force sponsored field studies
| PB93-194231 | p 3754 N93-32089

BIODYNAMICS
Prevention of cumulative trauma disorders
| PB93-188332 | p 3773 N93-31138
Transmission of vibration through the human body to the head: A summary of experimental data
| ISVR-TR-218 | p 3774 N93-32237

BIOINSTRUMENTATION
Prevention of cumulative trauma disorders
| PB93-188332 | p 3773 N93-31138
Modeling of optical waveguide biosensor structures
| VTT-PUBS-112 | p 3824 N93-32421

BIOLOGICAL EFFECTS
Investigation of laser-induced retinal damage
| AD-A264096 | p 3772 N93-31094
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 377)
| NASA-SP-7011(377) | p 3773 N93-31924
Mechanisms of microwave induced damage in biologic materials
| AD-A264415 | p 3772 N93-32035

BIOLOGICAL EVOLUTION
Spontaneous regulating mechanisms that may have led to the origin of life
| DE93-603677 | p 3771 N93-31161

BIOMASS ENERGY PRODUCTION
Japan's Sunshine Project
| DE93-768309 | p 3748 N93-31811
Session of alcohol and biomass energy technology
| DE93-768440 | p 3749 N93-32056
Study on new biomass energy systems
| DE93-768470 | p 3749 N93-32057

BIOMEDICAL DATA
An annotated bibliography of research involving women, conducted at the US Army Research Institute of Environmental Medicine
| AD-A265497 | p 3773 N93-31917

BIOPOLYMER DENATURATION
EXAM: A two-state thermodynamic analysis program
| PB93-191658 | p 3703 N93-31817

BIOTECHNOLOGY
Japan's Sunshine Project
| DE93-768309 | p 3748 N93-31811
Biological treatment of porous off-gases
| VTT-JULK-766 | p 3752 N93-31853

BIRD-AIRCRAFT COLLISIONS
Effects of air traffic on nature and environment in the neighborhood of airports by example of the Munich 2 Airport (Germany) p 3753 N93-31932

BIRDS
Effects of air traffic on nature and environment in the neighborhood of airports by example of the Munich 2 Airport (Germany) p 3753 N93-31932

BIT ERROR RATE
Combinatorial pulse position modulation for power-efficient free-space laser communications
| NASA-TM-106241 | p 3717 N93-31856

BIVARIATE ANALYSIS
Curve interpolation with constrained length
| MEMO-1079 | p 3804 N93-31467

BLACK HOLES (ASTRONOMY)
Constraints on cosmic strings due to black holes formed from collapsed cosmic string loops
| NASA-CR-193248 | p 3861 N93-31837

BLOOD
Fundamental diagnostic hematology: Anemia (second edition)
| PB93-188662 | p 3773 N93-31140
Fundamental diagnostic hematology: The bleeding and clotting disorders (second edition)
| PB93-188670 | p 3773 N93-31158
Blood lipids in aircrew recruits and in RAF aviators p 3774 N93-32251

BLOOD COAGULATION
Fundamental diagnostic hematology: The bleeding and clotting disorders (second edition)
| PB93-188670 | p 3773 N93-31158

BLOOD PRESSURE
Biological parameters and cardiovascular risk factors with the flying personnel of the Belgian Armed Forces p 3781 N93-32260

BODIES OF REVOLUTION
Navier-Stokes computations for kinetic energy projectiles in steady coning motion: A predictive capability for pitch damping
| AD-A264111 | p 3726 N93-32028

BODY MEASUREMENT (BIOLOGY)
Portable equipment developed to estimate energy expenditure by simultaneous recording of heart rate and body position p 3778 N93-32243

BODY TEMPERATURE
The effects of cockpit heat on aviator sleep parameters p 3782 N93-32266

BODY-WING AND TAIL CONFIGURATIONS
Low-speed wind tunnel study of the direct side-force characteristics of a joined-wing airplane with an upper fin
| DE93-767966 | p 3672 N93-31189
NLR inviscid transonic unsteady loads prediction methods in aeroelasticity
| NLR-TP-91410-U | p 3674 N93-32358

BOEING 747 AIRCRAFT
Evaluation of the flyability of MLS curved approaches for wide-body aircraft
| NLR-TP-91396-U | p 3680 N93-32416

BOLTZMANN TRANSPORT EQUATION
Contribution to the theoretical study and finite-element approximation of the multidimensional, multispecies, hyperbolic system of gas dynamics
| ESA-TT-1275 | p 3724 N93-31429

BOLTZMANN-VLASOV EQUATION
Kinetic nonlinear electron-ion two stream instability in field-free isothermal plasma
| DE93-608571 | p 3826 N93-31668

BOSON FIELDS
On the magnetoresistance of heavy fermion compounds
| DE93-608691 | p 3827 N93-31098

BOSONS
Nonclassical disordered phase in the strong quantum limit of frustrated antiferromagnets
| DE92-645691 | p 3815 N93-31806

BOUNDARY CONDITIONS
Modal synthesis technique used in shallow doublewall
| FFA-TN-1992-29 | p 3722 N93-31053
Point interactions on bounded domains
| REPT-92-97 | p 3807 N93-31654
Complex Kohn variational principle for the solution of Lippmann-Schwinger equations
| DE93-609885 | p 3814 N93-31910
Optimal control problems for parabolic boundary control systems p 3800 N93-32216

BOUNDARY ELEMENT METHOD
Iterative equation solving techniques in boundary element analysis p 3802 N93-31141

BOUNDARY INTEGRAL METHOD
Tokamak plasma shape identification based on the boundary integral equations
| DE93-715383 | p 3825 N93-31097
Iterative equation solving techniques in boundary element analysis p 3802 N93-31141

BOUNDARY LAYER CONTROL
Selected experiments in laminar flow: An annotated bibliography
| NASA-TM-103989 | p 3673 N93-32226

BOUNDARY LAYER FLOW
Wind profiling in a cloudy convective atmospheric boundary layer over land
| AD-A265422 | p 3768 N93-32051
Structure and stability of reacting compressible free shear layers
| AD-A265594 | p 3727 N93-32095

BOUNDARY LAYER PLASMAS
Exploring the magnetospheric boundary layer p 3855 N93-31694

BOUNDARY LAYER STABILITY
Effect of sound on boundary layer stability
| NASA-CR-193367 | p 3816 N93-32238

BOUNDARY LAYER TRANSITION
Plasma transport through magnetic boundaries p 3827 N93-31692
Can ULF fluctuations observed at the magnetopause play a role in anomalous diffusion? p 3855 N93-31693
Exploring the magnetospheric boundary layer p 3855 N93-31694
Multiple flows in the solar transition region p 3857 N93-31704
Investigation of fine-scale aurora with the Freja electric field instrument p 3860 N93-31719
Selected experiments in laminar flow: An annotated bibliography
| NASA-TM-103989 | p 3673 N93-32226

BOUNDARY LAYERS
Effect of sound on boundary layer stability
| NASA-CR-193367 | p 3816 N93-32238

BOUNDARY VALUE PROBLEMS
An operator method to study some resonance boundary value problems in elasticity theory
| REPT-92-84 | p 3740 N93-31490
Resonance and near-resonance for a nonlinear wave equation
| REPT-92-92 | p 3814 N93-31633
A remark about the mean curvature
| DE93-619668 | p 3809 N93-32285
Variational Trajectory Optimization Tool Set: Technical description and user's manual
| NASA-TM-4442 | p 3690 N93-32381
Parallel Jacobi iteration in implicit step-by-step methods
| CWI-NM-R9218 | p 3810 N93-32394
Explicit, high-order Runge-Kutta-Nystroem methods for parallel computers
| CWI-NM-R9219 | p 3796 N93-32395

BOW WAVES
ULF/ELF electromagnetic waves associated with the quasiperpendicular Earth's bow shock crossings p 3827 N93-31690
Energetic particles (greater than 34 KeV - 3.2 MeV) in the deep Martian magnetotail (X = 15.5 R(sub M)), modeling of the Martian bow shock and the influence of low solar wind pressure on Mars as an obstacle p 3855 N93-31691
Calculations on unsteady type 4 interaction at Mach 8
| AD-A265214 | p 3673 N93-32004

BRANCHING (MATHEMATICS)
On global bifurcations caused by the unfolding of a homoclinic orbit
| W-9221 | p 3806 N93-31524
A normally elliptic Hamiltonian bifurcation
| W-9214 | p 3807 N93-31623
Homoclinic twist bifurcations with Z2 symmetry
| W-9215 | p 3807 N93-31627
Parametric and combinatorial problems in constrained optimization
| AD-A265595 | p 3792 N93-32096

BRAZIL
Towards a sustainable urban environment: The Rio de Janeiro study
| PB93-187557 | p 3751 N93-31330

BRIGHTNESS
Predicting Ly-alpha intensities in coronal streamers p 3870 N93-31360
Ly-alpha radiation from coronal transients p 3870 N93-31363
On the Fabry-Perot investigations of the solar corona: Eclipse observations of the green line intensities and half widths p 3872 N93-31375
Morphology of coronal loop interactions p 3873 N93-31379
Adaptive optics for high power beam lines using diamond crystal monochromators
| DE93-009328 | p 3824 N93-31987

BRILLOUIN EFFECT
Rayleigh-Brillouin scattering for high-pressure gas temperature measurements p 3693 N93-31556

BRINES
Mars brine formation experiment p 3864 N93-31949

Microbiological test results of the environmental control and life support systems vapors compression distillation subsystem recycle tank components following various pretreatment protocols
[NASA-CR-192570] p 3772 N93-32354

BRITTLE MATERIALS
Evaluation of the chevron notch fracture toughness test for brittle materials
[NPL-DMM(A)-72] p 3742 N93-32384

BROKEN SYMMETRY
Lepton-quark families, cosmic strings and democratic mass matrix
[DE93-608263] p 3832 N93-31809

BUBBLES
Potential distributions at gas evolving electrodes
[DLR-FB-92-20] p 3702 N93-31319

BUCKLING
Web crippling of cold-formed steel members
[ISBN-9-03-860122-0] p 3705 N93-31540
Buckling and postbuckling of stiffened thin skinned carbon fibre composite panels
[ATN-9301] p 3742 N93-32331

BUCKMINSTERFULLERENE
Cyclocarbon coalescence: Mechanisms for tailormade fullerene formation
[AD-A265489] p 3821 N93-31995

BURGER EQUATION
Optimal fixed-finite-dimensional compensator for Burgers' equation with unbounded input/output operators
[NASA-CR-191454] p 3808 N93-31857

BURNING RATE
A summary of the JANNAF Workshop on Methods for Exchange of Gun Propellant Burning Rate Information
[AD-A264113] p 3713 N93-32030

BURSTS
Observation of particle bursts in the tail of planet Mars onboard the Phobos 2 spacecraft p 3856 N93-31699

C

CADASTRAL MAPPING
Reports on Cartography and Topography, series 1, report no. 103
[ETN-90-97325] p 3744 N93-31256
European Road Database: Activities within the ATKIS p 3744 N93-31257
Digital reading of road network data in developing a cartographic information system p 3744 N93-31259

CAFFEINE
Effects of caffeine on mental performance and mood: Implications for aircrew members p 3783 N93-32269

CALCULUS
The mechanization of lambda calculus
[REPT-92-60] p 3805 N93-31499
A single recursion operator is sufficient
[REPT-92-59] p 3805 N93-31500
A note on dynamic arrow logic
[LP-92-11] p 3788 N93-31532

CALCULUS OF VARIATIONS
Finite volume methods constructed by mixed variational formulation. Part 2: Error estimates in discrete energetic norms
[REPT-92-86] p 3805 N93-31488
Finite volume methods constructed by mixed variational formulation. Part 1: Description of the discretization technique
[REPT-92-85] p 3805 N93-31489

CALIBRATING
Calibration of ORFEUS echelle spectrometer
[ETN-93-94201] p 3691 N93-31048
The ZEUS uranium calorimeter: Main characteristics and first operating experience
[NIKHEF-H/92-15] p 3728 N93-31117
Calibration system for testing laboratory
[VTT-TIED-1401] p 3738 N93-31172
Characterisation of a protection level Am-241 calibration source
[NPL-RSA(EXT)-35] p 3819 N93-31335
Interaction of solar wind ions with thin carbon foils: Calibration of time-of-flight spectrometers p 3880 N93-31423
Surveillance schemes with applications to mass calibration
[PB93-181881] p 3810 N93-31430
Calibration of a detector system for solar energetic particles analysis p 3860 N93-31721
High resolution imaging from the ground using a satellite-borne laser guide star p 3849 N93-31781
SeaWiFS technical report series. Volume 10: Modeling of the SeaWiFS solar and lunar observations
[NASA-TM-104566-VOL-10] p 3770 N93-31859

CALORIC REQUIREMENTS
Trial of emergency ration of the Spanish Air Force p 3778 N93-32247
The effects of an antijet lag diet p 3781 N93-32263

CAMERAS
Development of nose structure of a reconnaissance container for a supersonic jet aircraft
[MBB-LME-242-S-PUB-0451] p 3679 N93-31046
Test measurements for quick analog digital converters for an x ray CCD camera
[ETN-93-94204] p 3728 N93-31119

CANTILEVER BEAMS
Design of multiple-ply laminated composite tapered beams
[NASA-TM-108411] p 3700 N93-31650

CAPACITANCE-VOLTAGE CHARACTERISTICS
Method and apparatus for characterizing the quality for electrically thin semiconductor films
[AD-D015734] p 3830 N93-32206

CAPACITORS
Investigation of trap emission kinetics MOS capacitors using a pump-probe charge integrating technique
[AD-A265198] p 3721 N93-31994

CAPE KENNEDY LAUNCH COMPLEX
Ground Robotic Hand Applications for the Space Program study (GRASP)
[NASA-CR-193571] p 3737 N93-32235

CAPILLARY TUBES
A first approximation to the effects of mean flow on sound propagation through cylindrical capillary tubes
[MATHS-REPT-A-181] p 3815 N93-31599

CAPILLARY WAVES
A study of capillary and capillary-gravity wind waves: Their structures, distributions, and energy balances p 3771 N93-32215

CAPTURE EFFECT
Carrier capture in 3-5 semiconductor quantum wells
[ETN-93-94054] p 3828 N93-31620

CARBIDES
Fundamental studies of new high-energy permanent magnet materials
[DE93-014707] p 3815 N93-32291

CARBOHYDRATE METABOLISM
Nutrition, Metabolic Disorders and Lifestyle of Aircrew
[AGARD-CP-533] p 3777 N93-32240

CARBOHYDRATES
Correlation of life-style and dietary concomitants of Greek pilots with serum analytes p 3780 N93-32256

CARBON
Carbon diffusion in uncoated and titanium nitride coated iron substrates during microwave plasma assisted chemical vapor deposition of diamond
[DE93-608934] p 3708 N93-31174
Investigation of carbon near the graphite-diamond-liquid triple point
[DE93-609052] p 3708 N93-31178
A high thrust density, C60 cluster, ion thruster
[AD-A264405] p 3691 N93-31188

CARBON DIOXIDE
Global changes and the air-sea exchange of chemicals
[DE93-605636] p 3750 N93-31092
Total CO2 and nitrate measurements in the southwest pacific during austral autumn, 1990
[PB93-188415] p 3769 N93-31333
Central Africa: Global climate change and development
[PB93-179612] p 3768 N93-31871
Experimental investigation of carbonate formation on Mars p 3866 N93-31959

CARBON DIOXIDE CONCENTRATION
Mars brine formation experiment p 3864 N93-31949

CARBON DIOXIDE LASERS
Report of the working group on far field accelerators
[AD-A265443] p 3732 N93-32021

CARBON DIOXIDE REMOVAL
Preliminary study on costs needed for solution of the global environmental problem
[DE93-768474] p 3754 N93-32039

CARBON FIBER REINFORCED PLASTICS
Consideration of impact damages by dimensioning CFC (Carbon Fiber Reinforced Composites) components
[MBB-FE-221-S-PUB-0501] p 3699 N93-31044
GARTEUR compression behaviour of advanced CFRP
[NLR-TP-91290-U] p 3701 N93-32202
Performance of an impact loaded sandwich plate
[VTT-JULK-767] p 3702 N93-32388

CARBON FIBERS
Method for producing hybrid graphite composite
[NASA-CASE-LEW-15241-2] p 3700 N93-31296
Perforated carbon-epoxy plates damage modeling for quasi-static biaxial loading
[ESA-TT-1273] p 3740 N93-31428

CARBON MONOXIDE
Molecules in the envelope of planetary nebulae with the example of CO-envelope of M2-9
[ETN-93-94203] p 3851 N93-31050
Making clean gasoline: The effect on jet fuels
[AD-A264302] p 3713 N93-32085

CARBON-CARBON COMPOSITES
Method for producing hybrid graphite composite
[NASA-CASE-LEW-15241-2] p 3700 N93-31296

CARBONATES
Mars brine formation experiment p 3864 N93-31949
Experimental investigation of carbonate formation on Mars p 3866 N93-31959
Attempts to comprehend Martian surface processes through interpretation of the oxygen isotopic compositions of carbonates in SNC meteorites p 3867 N93-31962

CARDIOVASCULAR SYSTEM
Lipodystrophies in the French military flight crew p 3774 N93-32249
Blood lipids in aircrew recruits and in RAF aviators p 3774 N93-32251
Cardiovascular risk factors in an Italian Air Force population: Preliminary report p 3775 N93-32252
Cardiovascular Risk Factors (CVRF) in Spanish pilots with coronary artery disease demonstrated by angiographic studies p 3775 N93-32253
Results and management of pathological lipoprotein concentrations and other cardiovascular risk factors in military pilots of the German Federal Armed Forces p 3775 N93-32254
Biological parameters and cardiovascular risk factors with the flying personnel of the Belgian Armed Forces p 3781 N93-32260

CARTESIAN COORDINATES
Differential small displacements and rotation extensions in three dimensional coordinate systems
[SER-B-295] p 3804 N93-31338
A plotting system for three-dimensional oblique coordinates (triangular mesh) of CITATION
[DE92-526848] p 3792 N93-32185

CARTRIDGES
The redwood project: An overview p 3841 N93-31979

CAST ALLOYS
An investigation of squeeze-cast alloy 718
[NASA-TM-108412] p 3706 N93-31646

CASTING
An investigation of squeeze-cast alloy 718
[NASA-TM-108412] p 3706 N93-31646

CASTINGS
Use of titanium castings without a casting factor
[AD-A264414] p 3705 N93-31192

CATALOGS (PUBLICATIONS)
Integrated access to distributed databases through intelligent interfaces p 3837 N93-31218
Publication catalogue of VTT in 1991
[VTT-TIED-1340] p 3838 N93-31535

CATALYSIS
New directions for the catalytic conversion of methane
[PB93-188795] p 3702 N93-31435

CATALYSTS
New directions for the catalytic conversion of methane
[PB93-188795] p 3702 N93-31435

CATEGORIES
Information systems as coalgebras
[ML-92-08] p 3838 N93-31481

CATHETERIZATION
The influence of dietary counseling and cardiac catheterization on lipid profiles in American military aviators p 3781 N93-32259

CATHODES
A high thrust density, C60 cluster, ion thruster
[AD-A264405] p 3691 N93-31188

CAVITIES
Temperature dependence of the femtosecond optical response in doped high temperature superconductors
[DE93-009514] p 3829 N93-31988

CELLS (BIOLOGY)
Investigation of laser-induced retinal damage
[AD-A264096] p 3772 N93-31094
Neurophysiological analysis of circadian rhythm entrainment
[AD-A264681] p 3774 N93-32018
Mechanisms of microwave induced damage in biologic materials
[AD-A264415] p 3772 N93-32035

CENTRAL PROCESSING UNITS
Processor-management in distributed systems with a compute-intensive workload
[REPT-92-52] p 3787 N93-31486
Decay-usage scheduling in multiprocessor and distributed systems. 1: Theory
[REPT-92-105] p 3795 N93-31864

CENTRIFUGES
Rotational speed control p 3689 N93-31457
Vibration isolation p 3690 N93-31458

CERAMIC COATINGS
Plasma sprayed ceramic thermal barrier coating for NiAl-based intermetallic alloys
[NASA-CASE-LEW-15535-1] p 3705 N93-31294
Microstructural studies of ceramic thermal carrier coatings; how it influences coatings thermomechanical resistance
[ONERA-NT-1992-9] p 3709 N93-31597

CERAMIC MATRIX COMPOSITES
SiC fiber-reinforced Celsian glass-ceramic matrix composite
[NASA-CASE-LEW-15264-1] p 3700 N93-31293
Method of producing a ceramic fiber-reinforced glass-ceramic matrix composite
[NASA-CASE-LEW-15264-2] p 3700 N93-31299
Internal structural characterization
[AD-A264762] p 3738 N93-31982
Ceramic technology project database
[DE93-012429] p 3710 N93-32161

CERAMICS
Tetragonal zirconia ceramics in Zr O2-Ce O2 system (CP): Preparation, characterization, and mechanical properties
[DE93-606833] p 3708 N93-31089
Thermal shock and fatigue behavior of ceramic tubes p 3739 N93-31139
Zirconia ceramics and mechanical surface interactions
[ETN-93-94049] p 3709 N93-31541
Precipitation hardening of infrared transmitting ZnS ceramics
[AD-A265184] p 3710 N93-31993
Ceramic technology project database
[DE93-012429] p 3710 N93-32161
Ceramics models in the MESA codes
[DE93-000683] p 3711 N93-32186
Physical characterization and study of the electrical magnetic and thermal properties of the ceramic high Tc superconductor Y1Ba2Cu3O(7-x)
[DE92-640219] p 3711 N93-32187

CERENKOV COUNTERS
Cerenkov type phase-matched second harmonic generation in polymeric channel waveguides
[AD-A265787] p 3710 N93-31801
Report of the working group on far field accelerators
[AD-A265443] p 3732 N93-32021

CERENKOV RADIATION
Cerenkov type phase-matched second harmonic generation in polymeric channel waveguides
[AD-A265787] p 3710 N93-31801
Report of the working group on far field accelerators
[AD-A265443] p 3732 N93-32021

CERTIFICATION
NIST scoring package certification procedures in conjunction with NIST special databases 2 and 6
[PB93-188126] p 3838 N93-31331

CHALCOGENIDES
Development of technical processes for manufacturing heavy metal fluoride glass fibers
[ETN-93-94200] p 3707 N93-31047

CHANNELS (DATA TRANSMISSION)
An investigation of the channel crosstalk in optical heterodyne controlled phased array radars
[AD-A265412] p 3717 N93-32046

CHAOS
The three-body problem in the ground-state representation
[DE93-608164] p 3803 N93-31289
Instabilities and nonstatistical behavior in globally coupled systems
[DE93-608185] p 3831 N93-31302
Chaotic dynamics of high density photon and exciton system
[DE93-608522] p 3819 N93-31666
Excitonic bistabilities, instabilities and chaos in laser-pumped semiconductor
[DE93-608677] p 3731 N93-31669
Desktop chaotic systems: Intuition and visualization
[NASA-TM-106258] p 3808 N93-31847
The effect of sensory input on trajectories generated by recurrent neural networks
[AD-A264501] p 3799 N93-32036
Investigation of transitions from order to chaos in dynamical systems
[DE93-014437] p 3833 N93-32290
Estimating the spatial extent of attractors of iterated function systems
[AD-A265856] p 3809 N93-32315

CHARACTER RECOGNITION
NIST scoring package certification procedures in conjunction with NIST special databases 2 and 6
[PB93-188126] p 3838 N93-31331
Optimization of adaptive resonance theory network with boltzmann machine
[PB93-188134] p 3797 N93-31332

CHARACTERIZATION
Functionalized polymeric materials for electronics and optics
[AD-A265788] p 3710 N93-31802
Internal structural characterization
[AD-A264762] p 3738 N93-31982
Improved gallium nitride and aluminum nitride electronic materials
[AD-A264570] p 3710 N93-32010
Evaluation of chemical conversion material (protective coating) exposed to space environmental conditions
[NASA-TM-108416] p 3730 N93-32366

CHARGE CARRIERS
Carrier capture in 3-5 semiconductor quantum wells
[ETN-93-94054] p 3828 N93-31620
Photoconductivity and photovoltage generation in novel photocrosslinkable nonlinear optical polymers
[AD-A265780] p 3750 N93-32417

CHARGE COUPLED DEVICES
Test measurements for quick analog digital converters for an x ray CCD camera
[ETN-93-94204] p 3728 N93-31119
Upgrade of the LIMDAS day/night whole sky imager
[AD-A265871] p 3769 N93-32171

CHARGE EXCHANGE
Interaction of solar wind ions with thin carbon foils: Calibration of time-of-flight spectrometers p 3880 N93-31423
Proceedings of the Workshop on Spin-Charge Transfer Reaction in Atomic Collision Process for planning of next period of cascade project
[DE93-704290] p 3821 N93-31834

CHARGE TRANSFER
Numerical studies of low temperature gallium arsenide buffer layers and their influence on device operation
[AD-A264296] p 3829 N93-32083

CHARGED PARTICLES
The conditions leading to intense low frequency generation and strong localization in two level systems
[AD-A265110] p 3819 N93-31791
A generalization of Dirac non-linear electrodynamics, and spinning charged particles
[DE93-609847] p 3821 N93-31907
DLTS and dynamic transconductance analysis of deep-submicron fully-depleted SOI MOSFETs
[AD-A264888] p 3721 N93-31984
Investigation of transitions from order to chaos in dynamical systems
[DE93-014437] p 3833 N93-32290
A unified approach to classical and quantum physics
[DE93-609843] p 3833 N93-32411

CHEBYSHEV APPROXIMATION
On the Chebyshev collocation approximation and domain decomposition
[FFI-92/7032] p 3807 N93-31598

CHECKOUT
The Delfi3 debugger: Notes on the implementation
[REPT-92-106] p 3790 N93-31850

CHEMICAL ANALYSIS
Air quality studies in Albuquerque, New Mexico
[PB93-190817] p 3751 N93-31212
Molecular dynamical and structural studies for the bakelite by neutron cross section measurements
[DE93-609444] p 3819 N93-31244
Rapid instrumental and separation methods for monitoring radionuclides in food and environmental samples
[DE93-608744] p 3820 N93-31813
Low-temperature formation of magnetic iron oxides p 3863 N93-31946
Advances in Analysis and Detection of Explosives. Proceedings of the 4th International Symposium on Analysis and Detection of Explosives
[AD-A265002] p 3713 N93-32077

CHEMICAL BONDS
Development of practical MO techniques for prediction of the properties and behavior of materials
[AD-A265730] p 3820 N93-31798
Systematic variations in the spectral properties of bright regions on Mars p 3864 N93-31951
Infinite volume extrapolations of finite cluster calculations. How correct are these?
[AD-A265648] p 3809 N93-32170

CHEMICAL COMPOSITION
Photospheric abundances p 3878 N93-31408
Advanced infrared spectroscopy for improved characterization of chemical systems
[PB93-174977] p 3703 N93-31875
Effects of the chemical environment on the spectroscopic properties of clays: Applications for Mars p 3862 N93-31936
Implications for volcanogenic volatile release on the weathering of Mars p 3862 N93-31939
Location of nanophase Fe-oxides in palagonitic soils: Implication for Martian pigments p 3863 N93-31943
Determination of the oxidative stability of perfluoropolyalkyl ethers and correlation with chemical structure
[NASA-TM-106223] p 3712 N93-32367

CHEMICAL EFFECTS
Chemical effects of ionizing radiations and electron beam in polymers: Industrial uses
[DE93-609337] p 3708 N93-31179

CHEMICAL ENGINEERING
Near miss reporting in the chemical process industry
[ISBN-9-03-860181-6] p 3714 N93-31539

CHEMICAL EQUILIBRIUM
EXAM: A two-state thermodynamic analysis program
[PB93-191658] p 3703 N93-31817

CHEMICAL EVOLUTION
On the weathering of Martian igneous rocks p 3862 N93-31941
Systematic variations in the spectral properties of bright regions on Mars p 3864 N93-31951

CHEMICAL EXPLOSIONS
NTO polymorphs
[DE93-005451] p 3712 N93-31186

CHEMICAL PROPERTIES
Dehydroxylated clay silicates on Mars: Riddles about the Martian regolith solved with ferrian saponites p 3862 N93-31937
Chemical and thermal stability of refrigerant-lubricant mixtures with metals
[DE93-013082] p 3715 N93-32163

CHEMICAL REACTIONS
Pion multiplicity as a probe of the deconfinement transition in heavy-ion collisions
[DE93-608484] p 3817 N93-31059
The kinetics of the hydriding of uranium metal 2
[DE93-004766] p 3704 N93-31184
Kinetics of mediated electron transfer between viologen groups in a self-assembled monolayer and metal complexes in solution
[AD-A265729] p 3820 N93-31797
Structure and properties of energetic materials
[AD-A265775] p 3713 N93-31800
Infrared spectroscopy of hydrogen and water on diamond (100)
[AD-A265531] p 3704 N93-31920
Investigation of diamond homoepitaxy by in situ Fizeau interferometry: The role of oxygen
[AD-A265544] p 3829 N93-31921
MSATT Workshop on Chemical Weathering on Mars
[NASA-CR-193209] p 3861 N93-31933
Using the Viking biology experimental results to obtain chemical information about Martian regolith p 3865 N93-31955
Time accurate simulations of compressible shear flows
[NASA-CR-193410] p 3728 N93-32371

CHINA
Investigation of atmospheric aerosols and gases at an east China station
[PB93-184539] p 3752 N93-31831
Source apportionment of air pollution in China: Extending the usefulness of receptor modeling by combining multivariate and chemical mass balance models
[PB93-185726] p 3756 N93-32188

CHIPS (ELECTRONICS)
An integrated eddy current detection and imaging system on a silicon chip p 3693 N93-31560

CHIRAL DYNAMICS
BRST quantization of 2D-Yang Mills theory with anomalies
[NIKHEF-H/92-13] p 3831 N93-31122

CHLOROFLUOROCARBONS
Materials compatibility and lubricants research on CFC-refrigerant substitutes
[DE93-014770] p 3711 N93-32292

CHOLESTEROL
Lipodystrophies in the French military flight crew p 3774 N93-32249
Lipidemic profile of Hellenic Airforce officers p 3774 N93-32250
Correlation of life-style and dietary concomitants of Greek pilots with serum analytes p 3780 N93-32256

CHONDRITES
Field and laboratory investigations of Antarctic meteorites collected by United States expeditions, 1985-1987
[PB93-182723] p 3861 N93-32415

CHROMOSPHERE
Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition
[ESA-SP-348] p 3867 N93-31343
Observation of a coronal streamer at meter and decimeter wavelengths p 3872 N93-31373
Underneath coronal loops: MSDP observations coordinated with SERTS 4 and NIXT flights p 3876 N93-31397

Momentum transport through the chromosphere p 3852 N93-31677
Multiple flows in the solar transition region p 3857 N93-31704

CIRCADIAN RHYTHMS
Melatonin, the pineal gland, and circadian rhythms [AD-A264099] p 3772 N93-31061
Organization of the human circadian system [AD-A264675] p 3774 N93-32015
Neurophysiological analysis of circadian rhythm entrainment [AD-A264681] p 3774 N93-32018
Human factors and the safety of flights: The importance of the management of sleep p 3782 N93-32267

CIRCUIT PROTECTION
Protection and regulation on direct-direct chopping converters [CNES-NT-129] p 3719 N93-31475

CIRCUITS
Transient analysis for ground fault distance estimation in electrical distribution networks [VTT-PUBS-115] p 3720 N93-31536
Noise attenuating circuit for mechanical relay including optical isolation [AD-D015700] p 3720 N93-31842

CIRCULAR POLARIZATION
Proceedings of the Workshop on Application of Circularly Polarized X Rays in the Region of 1 to 8 keV [DE93-704276] p 3823 N93-31165

CIRCUMFERENCES
Cycles in tough graphs: Updating the last four years [MEMO-1091] p 3810 N93-32398

CITIES
Air quality studies in Albuquerque, New Mexico [PB93-190817] p 3751 N93-31212
A searching method in a declarative city map p 3746 N93-31270
Towards a sustainable urban environment: The Rio de Janeiro study [PB93-187557] p 3751 N93-31330
Source apportionment of air pollution in China: Extending the usefulness of receptor modeling by combining multivariate and chemical mass balance models [PB93-185726] p 3756 N93-32188

CIVIL AVIATION
Engine technology challenges for a 21st Century High-Speed Civil Transport [NASA-TM-106216] p 3681 N93-31671
Reportable accidents to UK registered aircraft, and to foreign registered aircraft in UK airspace, 1990 [CAP-600] p 3674 N93-31730
Civil tiltrotor transport point design: Model 940A [NASA-CR-191446] p 3701 N93-32234
Propulsion technology challenges for turn-of-the-century commercial aircraft [NASA-TM-106192] p 3682 N93-32351

CLAMPS
Service equipment for use in hostile environments [NASA-CASE-LEW-14906-2] p 3734 N93-31314

CLASSICAL MECHANICS
A unified approach to classical and quantum physics [DE93-609843] p 3833 N93-32411

CLASSIFICATIONS
Computing with neural maps: Application to perceptual and cognitive function [AD-A264092] p 3743 N93-31060
Structurally stable quadratic systems without limit cycles [REPT-92-58] p 3805 N93-31501
Using machine learning techniques to automate sky survey catalog generation p 3843 N93-32143
Intelligent assistance in scientific data preparation p 3843 N93-32144
A neural network approach to seismic phase identification [DE93-013601] p 3800 N93-32305

CLAYS
Effects of the chemical environment on the spectroscopic properties of clays: Applications for Mars p 3862 N93-31936
Dehydroxylated clay silicates on Mars: Riddles about the Martian regolith solved with ferrian saponites p 3862 N93-31937
Preliminary results of an experimental study of the interactions of basalt glass and a water vapor atmosphere: Implications for weathering on Mars p 3864 N93-31948
Geochemistry and setting of Martian weathering: The Lafayette meteorite p 3866 N93-31961

CLEANERS
Performance of gas turbine compressor cleaners [NLR-TP-91237-U] p 3681 N93-31111

CLEARANCES
Excitation by flows in seals and clearances. Part 1: Introduction: Fluid-structure-interactions in rotordynamics. Part 2: Identification of rotordynamic coefficients of annular seals p 3738 N93-32275

CLIMATE
Mars brine formation experiment p 3864 N93-31949
Thermodynamic structure of subsidence inversions in the Atlantic subtropical anticyclone regime [AD-A265406] p 3768 N93-32043

CLIMATE CHANGE
Global changes and the air-sea exchange of chemicals [DE93-605636] p 3750 N93-31092
Variability of temperature and salinity in the Middle Atlantic Bight and Gulf of Maine [PB93-174019] p 3769 N93-31591
Central Africa: Global climate change and development [PB93-179612] p 3768 N93-31871
The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop [NASA-CP-3222] p 3758 N93-31878
Reconnaissance and deep-drill site selection on Taylor Dome, Antarctica p 3759 N93-31883
Radar studies of the West Antarctic ice streams p 3760 N93-31891
Aerogeophysical evidence for active volcanism beneath the West Antarctic Ice Sheet p 3761 N93-31895
Climatic effects of harmful emissions from high altitude air traffic p 3752 N93-31926
Climatic effects of turbofan emissions in the stratosphere and the higher troposphere p 3753 N93-31927
Recent changes of weather patterns in North America [DE93-013982] p 3769 N93-32289

CLIMATOLOGY
GCM control run of UK Meteorological Office compared with the real climate in the NW European winter [KNMI-WR-92-02] p 3767 N93-31601
Central Africa: Global climate change and development [PB93-179612] p 3768 N93-31871
Mean seasonal cycles and interannual variations at 0 deg, 165 deg E during 1986-1992 [PB93-186195] p 3768 N93-31874
Velocities of Thwaites and Land glaciers p 3760 N93-31885
Air Traffic and Environment [GSF-BAND-8] p 3752 N93-31925
Climatic effects of harmful emissions from high altitude air traffic p 3752 N93-31926
Tropical cyclone forecasters reference guide, No. 3: Tropical cyclone formation [AD-A265216] p 3768 N93-32005

CLINICAL MEDICINE
Annual report of the National Institute of Radiological Sciences [DE93-704237] p 3820 N93-31810

CLOCKS
Global synchronization algorithms for the Intel iPSC/860 [NASA-CR-193618] p 3793 N93-32361

CLOSED ECOLOGICAL SYSTEMS
Atmospheric control systems p 3689 N93-31456

CLOTTING
Fundamental diagnostic hematology: The bleeding and clotting disorders (second edition) [PB93-188670] p 3773 N93-31158

CLOUD COVER
Preliminary evaluation of aviation-impact variables derived from numerical models [PB93-190197] p 3767 N93-31202
Upgrade of the LIMDAS day/night whole sky imager [AD-A265871] p 3769 N93-32171

CLOUDS (METEOROLOGY)
Chemistry and acidity of cloud water at Mount Washington, NH [PB93-190684] p 3767 N93-31206

CLUSTER MISSION
Study of the Solar-Terrestrial System [ESA-SP-346] p 3852 N93-31674
Coordination of the solar terrestrial science by the IACG: Inter-Agency Consultative Group for Space Science p 3852 N93-31675
The implementation of the digital wave processor for the ESA/NASA Cluster mission p 3858 N93-31708
Auroral Cluster: Science objectives and measurement strategies p 3858 N93-31710
Co-ordinated data handling for the UK participants in the Cluster mission p 3843 N93-31713
Plasma waves interferometry on Cluster p 3827 N93-31714
Distributed data systems in space physics p 3859 N93-31715

CLUTTER
The method of smoothing applied to composite rough surface [AD-A265236] p 3701 N93-32062

CMOS
Petite amateur naval satellite spacecraft digital control system: A hardware design [AD-A265234] p 3690 N93-32061

COALESCING
Cyclocarbon coalescence: Mechanisms for tailormade fullerene formation [AD-A265489] p 3821 N93-31995

COASTAL WATER
A numerical study of seasonal wind forcing effects on the California current system [AD-A264951] p 3770 N93-32075

COASTAL ZONE COLOR SCANNER
SeaWiFS Technical Report Series. Volume 4: An analysis of GAC sampling algorithms: A case study [NASA-TM-104566-VOL-4] p 3771 N93-32360

COASTS
Global changes and the air-sea exchange of chemicals [DE93-605636] p 3750 N93-31092
Florida's estuaries: A citizen's guide to coastal living and conservation [PB93-189330] p 3751 N93-31113
Benthic study of the continental slope off Cape Hatteras, North Carolina, volume 2 [PB93-186070] p 3771 N93-32190

COATING
Oxidation resistant overlay coatings for low expansion substrates [NASA-CASE-LEW-15154-2] p 3708 N93-31300
Epoxy self-priming topcoats [AD-D015737] p 3711 N93-32209

COBALT ALLOYS
Axial and torsional fatigue behavior of a cobalt-base alloy p 3697 N93-31582

COBOL
COBOL Compiler Validation System (CCVS 85), user guide, version 4.2 [PB93-163178] p 3785 N93-31112

COCKPIT SIMULATORS
ATTAS experimental-cockpit and ATMOS for component and system investigations in flight guidance p 3676 N93-31276
The effects of cockpit heat on aviator sleep parameters p 3782 N93-32266

COCKPITS
ATTAS experimental-cockpit and ATMOS for component and system investigations in flight guidance p 3676 N93-31276

CODING
Code vector density in topographic mappings [RSRE-MEMO-4669] p 3746 N93-31611
Fractal image coding techniques and contraction operators [REPT-92-93] p 3789 N93-31632
Fractal coding of monochrome images [REPT-92-99] p 3790 N93-31656
Internation aircraft operator information system [DOT/FAA/CT-93/4] p 3671 N93-32232

COGNITION
High level cognitive information processing in neural networks [NASA-CR-193296] p 3800 N93-32341
Strategic control of reactive behavior in intelligent agents [AD-A264376] p 3801 N93-32413

COGNITIVE PSYCHOLOGY
Background and objectives of the PARAT program p 3775 N93-31230
Phases of the project development and examination methodologies p 3775 N93-31231
The position test: A computer generated process for acquisition of inductive logic thinking p 3775 N93-31232
A decision-theoretic approach to the display of information for time-critical decisions: The Vista project p 3784 N93-32152

COHERENT RADIATION
Measurement of the spatial coherence of a soft x ray laser [DE93-609404] p 3731 N93-31227

COHERENT SCATTERING
Measurement of the spatial coherence of a soft x ray laser [DE93-609404] p 3731 N93-31227

COLLECTION
Field and laboratory investigations of Antarctic meteorites collected by United States expeditions, 1985-1987 [PB93-182723] p 3861 N93-32415

COLLISION AVOIDANCE
UK airmisses involving commercial air transport, September - December 1991
[ETN-93-93930] p 3674 N93-32409
COLLISION PARAMETERS
Excitation of atomic hydrogen
[DE93-604639] p 3820 N93-31822
COLLISIONLESS PLASMAS
The interaction of a moving spacecraft with the ionosphere: Current collection and wake structure
p 3688 N93-31157
Quasi-parallel shock re-formation: Two-dimensional simulations p 3826 N93-31682
Ion acceleration at parallel shocks: Self-consistent plasma simulations p 3826 N93-31683
On Short Large Amplitude Magnetic Structures in the vicinity of the quasi-parallel region of the Earth's bow shock p 3854 N93-31688
Energetics of ULF/ELF plasma waves in the solar wind and outer Earth's magnetosphere p 3826 N93-31689
ULF/ELF electromagnetic waves associated with the quasiperpendicular Earth's bow shock crossings
p 3827 N93-31690
Collisionless magnetotail reconnection and substorms
p 3856 N93-31698
COLLISIONS
Momentum transport through the chromosphere
p 3852 N93-31677
COLOR
The fate of iron on Mars: Mechanism of oxidation of basaltic minerals to ferric-bearing assemblages
p 3862 N93-31938
Systematic variations in the spectral properties of bright regions on Mars p 3864 N93-31951
COMBAT
A high-fidelity, six-degree-of-freedom batch simulation environment for tactical guidance research and evaluation
[NASA-TM-4440] p 3684 N93-32380
COMBINATIONS (MATHEMATICS)
The mechanization of lambda calculus
[REPT-92-60] p 3805 N93-31499
COMBINATORIAL ANALYSIS
ALGODESK: An experimental comparison of eight evolutionary heuristics applied to the QAP problem
[REPT-92-052] p 3786 N93-31250
Multivariate problems of statistics, combinatorics, reliability, and signal processing
[AD-A265213] p 3811 N93-32003
Parametric and combinatorial problems in constrained optimization
[AD-A265595] p 3792 N93-32096
COMBUSTION
Flammability and explosion limits of H2 and H2/CO: A literature review
[AD-A264896] p 3702 N93-31064
Structure and properties of energetic materials
[AD-A265775] p 3713 N93-31800
COMBUSTION CHAMBERS
Analytical and experimental investigations of the oblique detonation wave engine concept
[NASA-TM-102839] p 3683 N93-32374
COMBUSTION PRODUCTS
Radiation/convection coupling in rocket motor and plume analysis
[NASA-CR-193288] p 3698 N93-31845
COMBUSTION TEMPERATURE
Initial results from the NASA-Lewis wave rotor experiment
[NASA-TM-106148] p 3683 N93-32368
COMBUSTION WIND TUNNELS
Evaluation of candidate working fluid formulations for the electrothermal-chemical wind tunnel
[NASA-CR-193366] p 3684 N93-31848
COMETS
Sungrazing comet observations associated with SOHO
p 3871 N93-31369
COMMAND AND CONTROL
An investigation of methods for improving models of ionospheric plasma-density irregularities and radio-frequency scintillation
[AD-A264156] p 3756 N93-31062
EHF military communication satellite alternatives study
[SS/L-TR00775] p 3716 N93-31311
COMMAND LANGUAGES
Integrated access to distributed databases through intelligent interfaces p 3837 N93-31218
COMMERCE
End users: New products and services
p 3837 N93-31220
COMMERCIAL AIRCRAFT
Radiation exposure in aircraft p 3753 N93-31928
Aircraft accident report: Controlled collision with terrain GP Express Airlines, Inc., Flight 861, a Beechcraft C99, N118GP, Anniston, Alabama, 8 June 1992
[PB93-910403] p 3674 N93-32196
Propulsion technology challenges for turn-of-the-century commercial aircraft
[NASA-TM-106192] p 3682 N93-32351
UK airmisses involving commercial air transport, September - December 1991
[ETN-93-93930] p 3674 N93-32409
COMMUNICATING
Tapes, queues and communicating automata in DIAC
[REPT-92-94] p 3789 N93-31631
COMMUNICATION EQUIPMENT
Space qualification for an intersatellite laser communications system
[AD-A265145] p 3717 N93-31989
COMMUNICATION NETWORKS
Integrated access to distributed databases through intelligent interfaces p 3837 N93-31218
The modern research environment
p 3837 N93-31221
Process control and recovery in the Link Monitor and Control Operator Assistant p 3719 N93-32145
Data communication network at the ASRM facility
[NASA-CR-193625] p 3686 N93-32236
COMMUNICATION SATELLITES
EHF military communication satellite alternatives study
[SS/L-TR00775] p 3716 N93-31311
Space qualification for an intersatellite laser communications system
[AD-A265145] p 3717 N93-31989
COMMUTATION
A design for a visual motion transducer
[OUEL-1960/92] p 3785 N93-31054
COMPACTING
Tetragonal zirconia ceramics in Zr O2-Ce O2 system (CP): Preparation, characterization, and mechanical properties
[DE93-606833] p 3708 N93-31089
COMPATIBILITY
Materials compatibility and lubricants research on CFC-refrigerant substitutes
[DE93-014770] p 3711 N93-32292
COMPENSATORS
Optimal fixed-finite-dimensional compensator for Burgers' equation with unbounded input/output operators
[NASA-CR-191454] p 3808 N93-31857
COMPILERS
COBOL Compiler Validation System (CCVS 85), user guide, version 4.2
[PB93-163178] p 3785 N93-31112
Software engineering p 3794 N93-32154
COMPLEX NUMBERS
Geometrical aspects of quaternions and complex numbers
[REPT-92-56] p 3807 N93-31612
COMPLEX SYSTEMS
Reduction method with system analysis for multiobjective optimization-based design
[NASA-CR-191456] p 3803 N93-31194
Advanced Artificial Intelligence Technology Testbed
p 3801 N93-32126
Mixed data/goal driven intelligent real-time assessment and control p 3794 N93-32140
A decision-theoretic approach to the display of information for time-critical decisions: The Vista project
p 3784 N93-32152
COMPONENT RELIABILITY
Commercialization of NESSUS: Status
p 3695 N93-31567
Life extending control: An interdisciplinary engineering thrust p 3697 N93-31581
Evaluation of future space transportation systems with regard to their reliability and costs
[ESA-TT-1281] p 3687 N93-31593
COMPOSITE MATERIALS
Overall properties of composite materials: A general model based on periodic microstructure
p 3699 N93-31143
Oxidation resistant overlay coatings for low expansion substrates
[NASA-CASE-LEW-15154-2] p 3708 N93-31300
Composites design handbook: Update
[ESA-PSS-03-1101-ISSUE-1-RE] p 3701 N93-31740
The method of smoothing applied to composite rough surface
[AD-A265236] p 3701 N93-32062
Stress-rupture behavior of small diameter polycrystalline alumina fibers
[NASA-TM-106256] p 3712 N93-32382
COMPOSITE PROPELLANTS
Commissioning and operating instructions of one pint (US) mixer
[MRL-TN-634] p 3713 N93-31639
COMPOSITE STRUCTURES
Reusable cryogenic liquid rocket propellant tank
[NASA-CASE-LAR-14172-1] p 3692 N93-31295
Design of multiple-ply laminated composite tapered beams
[NASA-TM-108411] p 3700 N93-31650
Low cost guideways to Maglev
[PB93-154847] p 3735 N93-31727
A thermoelastic model for thick composite rings
[AD-A264112] p 3701 N93-32029
A mechanics model for the compressive response of fiber reinforced composites
[AD-A265556] p 3701 N93-32067
Buckling and postbuckling of stiffened thin skinned carbon fibre composite panels
[ATN-9301] p 3742 N93-32331
COMPRESSED GAS
Feasibility study on introduction of petroleum substituting energy for transportation
[DE93-768472] p 3750 N93-32058
COMPRESSIBILITY
Compressive strengths of fiber-reinforced composites with interface debonding p 3699 N93-31136
A mechanics model for the compressive response of fiber reinforced composites
[AD-A265556] p 3701 N93-32067
COMPRESSIBLE BOUNDARY LAYER
Parametric studies of shock wave/boundary layer interactions over 2D compression corners at Mach 6
[VKI-TN-181] p 3672 N93-31538
COMPRESSIBLE FLOW
WBNFLOW: Multi-grid/multi-block potential solver for compressible flow. User's guide
[FFA-TN-1992-43] p 3723 N93-31146
F2D: A two-dimensional compressible gas flow code
[DE93-003239] p 3723 N93-31169
Structure and stability of reacting compressible free shear layers
[AD-A265594] p 3727 N93-32095
Time accurate simulations of compressible shear flows
[NASA-CR-193410] p 3728 N93-32371
COMPRESSION LOADS
Consideration of impact damages by dimensioning CFC (Carbon Fiber Reinforced Composites) components
[MBB-FE-221-S-PUB-0501] p 3699 N93-31044
COMPRESSION TESTS
GARTEUR compression behaviour of advanced CFRP
[NLR-TP-91290-U] p 3701 N93-32202
Buckling and postbuckling of stiffened thin skinned carbon fibre composite panels
[ATN-9301] p 3742 N93-32331
COMPRESSIVE STRENGTH
Consideration of impact damages by dimensioning CFC (Carbon Fiber Reinforced Composites) components
[MBB-FE-221-S-PUB-0501] p 3699 N93-31044
Compressive strengths of fiber-reinforced composites with interface debonding p 3699 N93-31136
A mechanics model for the compressive response of fiber reinforced composites
[AD-A265556] p 3701 N93-32067
COMPRESSOR BLADES
Performance of gas turbine compressor cleaners
[NLR-TP-91237-U] p 3681 N93-31111
COMPRESSORS
Electropneumatic actuator, phase 1
[PB93-174951] p 3720 N93-31876
COMPUTATION
A new definition of SLDNF-resolution
[CT-92-03] p 3806 N93-31530
Sequent calculi for normal modal propositional logics
[LP-92-12] p 3806 N93-31533
COMPUTATIONAL CHEMISTRY
Development of practical MO techniques for prediction of the properties and behavior of materials
[AD-A265730] p 3820 N93-31798
COMPUTATIONAL FLUID DYNAMICS
WBNFLOW: Multi-grid/multi-block potential solver for compressible flow. User's guide
[FFA-TN-1992-43] p 3723 N93-31146
Numerical simulations of three-dimensional laminar flow over a backward facing step; flow near side walls
[NASA-TM-106248] p 3723 N93-31147
Computational methods for aerodynamic design of aircraft components
[NLR-TP-92072-4] p 3671 N93-31148
F2D: A two-dimensional compressible gas flow code
[DE93-003239] p 3723 N93-31169
Three-dimensional modeling of pollutant transport in surface waters
[PB93-190627] p 3751 N93-31203
Contribution to the experimental and theoretical study of vortex breakdown
[ONERA-NT-1990-12] p 3724 N93-31477
Three-dimensional flow calculations inside SSME GGGT first stage blade rows p 3697 N93-31585
An ILU smoother for the incompressible Navier-Stokes equations in general coordinates
[REPT-92-91] p 3725 N93-31634

Numerical simulation of the flow in a 1:57-scale axisymmetric model of a large blast simulator
[AD-A265551] p 3685 N93-31916
An incompressible axisymmetric through-flow calculation procedure for design and off-design analysis of turbomachinery
[AD-A264933] p 3726 N93-32071
Panel methods for aerodynamic analysis and design
[NLR-TP-91404-U] p 3674 N93-32357
NLR inviscid transonic unsteady loads prediction methods in aeroelasticity
[NLR-TP-91410-U] p 3674 N93-32358
Analytical and experimental investigations of the oblique detonation wave engine concept
[NASA-TM-102839] p 3683 N93-32374

COMPUTATIONAL GEOMETRY
Performance of scanline-oriented CSG direct display algorithms
[REPT-93-03] p 3788 N93-31548

COMPUTATIONAL GRIDS
The ViB-code to simulate 3-D stator/rotor flow in axial turbines
[DLR-FB-92-19] p 3681 N93-31170
Blasim: A computational tool to assess ice impact damage on engine blades
[NASA-TM-106225] p 3740 N93-31193
Benchmark solutions for the incompressible Navier-Stokes equations in general coordinates on staggered grids
[REPT-92-67] p 3724 N93-31496
Mapping methods for computationally efficient and accurate structural reliability p 3695 N93-31572
Numerical simulation of the flow in a 1:57-scale axisymmetric model of a large blast simulator
[AD-A265551] p 3685 N93-31916
Feed-forward volume rendering algorithm for moderately parallel MIMD machines
[NASA-CR-191158] p 3792 N93-32322

COMPUTER AIDED DESIGN
Knowledge-based framework for an automated user interface presentation design tool p 3836 N93-31135
Computational methods for aerodynamic design of aircraft components
[NLR-TP-92072-4] p 3671 N93-31148
Cut locus and medial axis in global shape interrogation and representation
[PB93-189884] p 3786 N93-31199
Design and implementation strategies
[MEMO-INF-92-57] p 3788 N93-31511
Structural dynamics: Probabilistic structural analysis methods. Program overview p 3694 N93-31562
Rocketdyne PSAM: In-house enhancement/application p 3694 N93-31566
System reliability and risk assessment task goals and status p 3695 N93-31568
On the selection of an optimal set of secondary indices
[MEMO-INF-92-68] p 3789 N93-31617
Applications of structural optimization methods to fixed-wing aircraft and spacecraft in the 1980s
[NASA-TM-103939] p 3740 N93-32212
Performance analysis of a large-grain dataflow scheduling paradigm
[NASA-TP-3323] p 3796 N93-32213
Generalised curvature continuous rational cubics
[MATHS-REPT-A-180] p 3809 N93-32347

COMPUTER AIDED MAPPING
Extracting projective information from single views of 3D point sets
[OUEL-1927/92] p 3785 N93-31151
Reports on Cartography and Topography, series 1, report no. 103
[ETN-90-97325] p 3744 N93-31256
European Road Database: Activities within the ATKIS p 3744 N93-31257
Aerial cartography using SICAD NAV-AIR p 3744 N93-31258
Digital reading of road network data in developing a cartographic information system p 3744 N93-31259
GDF: A digitizing format for geographical data p 3744 N93-31260
A query language for spatial data p 3745 N93-31261
An electronic sea map p 3745 N93-31262
Automatic acquisition of elevation points in map-making using the TUEK 200 p 3745 N93-31263
A catalog of landscape features. A modeling instrument for the ATKIS information system p 3745 N93-31264
Accuracy estimation for digitizing p 3745 N93-31265
Geographical and topographical data from satellite images used in developing a digital road topology database p 3745 N93-31266
Access and content of the EDBS topographic-cartographic information system (ATKIS) p 3745 N93-31267
SCRIBO: An interactive grid-base name placement system for map making p 3745 N93-31268
A searching method in a declarative city map p 3746 N93-31270

COMPUTER AIDED TOMOGRAPHY
Computerized tomography and its applications: A guided tour
[CS-9206] p 3789 N93-31629

COMPUTER DESIGN
On the selection of an optimal set of secondary indices
[MEMO-INF-92-68] p 3789 N93-31617

COMPUTER GRAPHICS
SCRIBO: An interactive grid-base name placement system for map making p 3745 N93-31268
Fluid flow visualization
[REPT-92-69] p 3724 N93-31494
Hybrid rendering of scientific data using an h-buffer
[REPT-92-68] p 3788 N93-31495
Performance of scanline-oriented CSG direct display algorithms
[REPT-93-03] p 3788 N93-31548
Graphics simulation and training aids for advanced teleoperation p 3793 N93-32119
Feed-forward volume rendering algorithm for moderately parallel MIMD machines
[NASA-CR-191158] p 3792 N93-32322

COMPUTER INFORMATION SECURITY
Modeling users' behavior and threats for security
[REPT-92-071] p 3811 N93-31476
TSCA confidential business information security manual
[PB93-184844] p 3839 N93-31833
System engineering concept demonstration, security study, volume 7
[AD-A265473] p 3791 N93-32007

COMPUTER NETWORKS
Newly available technologies present expanding opportunities for scientific and technical information exchange p 3837 N93-31217
Integrated access to distributed databases through intelligent interfaces p 3837 N93-31218
The modern research environment p 3837 N93-31221
Measurements over distributed high performance computing and storage systems p 3841 N93-31977
Performance of a distributed superscalar storage server p 3841 N93-31978
New architectures to reduce I/O bottlenecks in high-performance systems
[DE93-009059] p 3795 N93-31985
Neural attentional sensory processing
[AD-A265163] p 3799 N93-31992
Data communication network at the ASRM facility
[NASA-CR-193625] p 3686 N93-32236
Video conferencing made easy
[DE93-010798] p 3718 N93-32283

COMPUTER PROGRAM INTEGRITY
Modeling users' behavior and threats for security
[REPT-92-071] p 3811 N93-31476
The performance of integrity control through transaction modification in a parallel main-memory database system
[MEMO-INF-92-54] p 3839 N93-31615

COMPUTER PROGRAMMING
Deriving incremental production rules for deductive data
[REPT-92-081] p 3787 N93-31466
A formal discourse grammar tackling verb phrase anaphora
[CL-91-03] p 3787 N93-31478
Termination criteria for GMRES-like methods to solve the discretized incompressible Navier-Stokes equations
[REPT-92-50] p 3724 N93-31484
Development of a case tool to support decision based software development
[NASA-CR-193289] p 3790 N93-31738
Formal specification and verification of concurrent programs
[AD-A265201] p 3790 N93-31793
An overview of PCTE: A basis for a Portable Commo n Tool Environment
[AD-A265202] p 3791 N93-32000
System engineering concept demonstration, security study, volume 7
[AD-A265473] p 3791 N93-32007
System engineering concept demonstration, effort summary, volume 1
[AD-A265467] p 3791 N93-32022
System engineering concept demonstration, system engineering needs, volume 2
[AD-A265468] p 3791 N93-32023
System engineering concept demonstration, interface standards studies, volume 4
[AD-A265470] p 3791 N93-32024
Venari/ML interfaces and examples
[AD-A265416] p 3841 N93-32048
Research in transparent informed prefetching
[AD-A265417] p 3842 N93-32049
Knowledge-based software development tools
[AD-A265218] p 3791 N93-32059
An iconic programming language for sensor-based robots p 3793 N93-32098
Automated assembly of large space structures using an expert system executive p 3690 N93-32102
Software engineering p 3794 N93-32154
The Knowledge-Based Software Assistant: Beyond CASE p 3794 N93-32156
The enhanced Software Life Cyle Support Environment (ProSLCSE): Automation for enterprise and process modeling p 3794 N93-32158
Initial definition of a Knowledge-Based Software Quality Assistant
[AD-A265866] p 3793 N93-32418

COMPUTER PROGRAMS
Case studies in the numerical solution of oscillatory integrals
[DE92-642554] p 3801 N93-31067
Operation of the helicopter antenna radiation prediction code
[NASA-CR-193259] p 3715 N93-31110
The kinetics of the hydriding of uranium metal 2
[DE93-004766] p 3704 N93-31184
Structural reliability methods: Code development status p 3694 N93-31563
Probabilistic load simulation: Code development status p 3694 N93-31564
Probabilistic evaluation of SSME structural components p 3694 N93-31565
Rocketdyne PSAM: In-house enhancement/application p 3694 N93-31566
System reliability and risk assessment task goals and status p 3695 N93-31568
Probabilistic structural analysis algorithm development for computational efficiency p 3695 N93-31569
Software to model AXAF image quality
[NASA-CR-192574] p 3789 N93-31637
Comparison of straight and 15 degree vectored nozzles using a six component thrust stand
[NASA-CR-193291] p 3725 N93-31641
Temporal and spatial analysis in knowledge-based physics problem-solving p 3814 N93-31651
Formal specification and verification of concurrent programs
[AD-A265201] p 3790 N93-31793
Development of practical MO techniques for prediction of the properties and behavior of materials
[AD-A265730] p 3820 N93-31798
EXAM: A two-state thermodynamic analysis program
[PB93-191658] p 3703 N93-31817
The development of detection technique for fatigue crack due to thermal stratification phenomena in RCS piping
[DE93-605749] p 3740 N93-31823
The Delfi3 debugger: Notes on the implementation
[REPT-92-106] p 3790 N93-31850
Architectural assessment of mass storage systems at GSFC p 3841 N93-31980
System engineering concept demonstration, effort summary, volume 1
[AD-A265467] p 3791 N93-32022
Knowledge-based software development tools
[AD-A265218] p 3791 N93-32059
Benet improvements made on Los Alamos electromagnetic field code
[AD-A265474] p 3718 N93-32065
A survey of codes for modeling electromagnetic launch
[AD-A264946] p 3687 N93-32074
Upgrade of the LIMDAS day/night whole sky imager
[AD-A265871] p 3769 N93-32171
Fast Fourier Transform analysis of computer-acquired friction data
[DE93-010337] p 3736 N93-32179
A plotting system for three-dimensional oblique coordinates (triangular mesh) of CITATION
[DE92-526848] p 3792 N93-32185
Ceramics models in the MESA codes
[DE93-000683] p 3711 N93-32186
Advanced Transport Operating System (ATOPS) utility library software description
[NASA-CR-191469] p 3680 N93-32218
An automated processing system for food frequency and nutrition knowledge questionnaire p 3778 N93-32241
Estimating the spatial extent of attractors of iterated function systems
[AD-A265856] p 3809 N93-32315
An acoustic scattering code
[AD-A265863] p 3816 N93-32316

COMPUTER STORAGE DEVICES
Goddard Conference on Mass Storage Systems and Technologies, volume 2
[NASA-CP-3198-VOL-2] p 3839 N93-31964

Current state of the mass storage system reference model p 3840 N93-31965
National Media Laboratory: Media testing results p 3840 N93-31972
Grand challenges in mass storage: A system integrator's perspective p 3840 N93-31973
Measurements over distributed high performance computing and storage systems p 3841 N93-31977
Performance of a distributed superscalar storage server p 3841 N93-31978
The redwood project: An overview p 3841 N93-31979
Architectural assessment of mass storage systems at GSFC p 3841 N93-31980
Research in transparent informed prefetching [AD-A265417] p 3842 N93-32049

COMPUTER SYSTEMS DESIGN
Timing analysis of real-time systems [REPT-92-060] p 3803 N93-31251
Current state of the mass storage system reference model p 3840 N93-31965
Grand challenges in mass storage: A system integrator's perspective p 3840 N93-31973
System engineering concept demonstration, effort summary, volume 1 [AD-A265467] p 3791 N93-32022
System engineering concept demonstration, system engineering needs, volume 2 [AD-A265468] p 3791 N93-32023
Validation of survivability validation protocols [AD-A264402] p 3791 N93-32034
Experimental analysis of computer system dependability [NASA-CR-193401] p 3785 N93-32233

COMPUTER SYSTEMS PERFORMANCE
The management of replicated data p 3836 N93-31144
Timing analysis of real-time systems [REPT-92-060] p 3803 N93-31251
The performance of integrity control through transaction modification in a parallel main-memory database system [MEMO-INF-92-54] p 3839 N93-31615
Measurements over distributed high performance computing and storage systems p 3841 N93-31977
Performance of a distributed superscalar storage server p 3841 N93-31978
Architectural assessment of mass storage systems at GSFC p 3841 N93-31980
Experimental analysis of computer system dependability [NASA-CR-193401] p 3785 N93-32233
Performance measures of parallel digital signal processor systems [AD-A265804] p 3718 N93-32313

COMPUTER SYSTEMS PROGRAMS
Advanced Transport Operating System (ATOPS) utility library software description [NASA-CR-191469] p 3680 N93-32218

COMPUTER SYSTEMS SIMULATION
Experimental analysis of computer system dependability [NASA-CR-193401] p 3785 N93-32233

COMPUTER TECHNIQUES
The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 3, part 2 [PB93-174811] p 3748 N93-31105
The aircraft position tests: A computer generated process for acquisition of spatial orientation capability p 3776 N93-31236
System engineering concept demonstration, effort summary, volume 1 [AD-A265467] p 3791 N93-32022
Protocols for distributive scheduling p 3835 N93-32129
The enhanced Software Life Cyle Support Environment (ProSLCSE): Automation for enterprise and process modeling p 3794 N93-32158

COMPUTER VISION
A design for a visual motion transducer [OUEL-1960/92] p 3785 N93-31054
A framework for spatio-temporal control in the tracking of visual contours [OUEL-1961/92] p 3785 N93-31055
Computing with neural maps: Application to perceptual and cognitive function [AD-A264092] p 3743 N93-31060
A theory of planar grasp [OUEL-1958/92] p 3785 N93-31126
Automatic acquisition of elevation points in map-making using the TUEK 200 p 3745 N93-31263
A vision system planner for increasing the autonomy of the Extravehicular Activity Helper/Retriever [NASA-CR-193301] p 3777 N93-31844
Sensor fusion for assured vision in space applications p 3824 N93-32105
Fire protection for launch facilities using machine vision fire detection p 3687 N93-32113
Automatic Target Recognition (ATR) using Distributed Associative Memories (DAMS) [AD-A265613] p 3800 N93-32169

COMPUTERIZED SIMULATION
Mathematical simulation of the induced gamma-radiation in structural materials of spaceships [*DE93-606751*] p 3688 N93-31076
Computer simulation of 3D material microstructure and its application in the determination of mechanical behavior of polycrystalline materials and engineering structures p 3708 N93-31134
The ViB-code to simulate 3-D stator/rotor flow in axial turbines [DLR-FB-92-19] p 3681 N93-31170
Probabilistic load simulation: Code development status p 3694 N93-31564
Expert system development for probabilistic load simulation p 3695 N93-31570
One-dimensional numerical simulations of the low-frequency electric fields in the CRIT1 and CRIT2 rocket experiments [TRITA-ALP-1992-01] p 3758 N93-31625
Computer simulation of energy profiles in a plasma focus device [DE93-608560] p 3826 N93-31673
Three-dimensional numerical simulation of interplanetary magnetic field changes at 1 AU as a consequence of simulated solar flares p 3860 N93-31723
Desktop chaotic systems: Intuition and visualization [NASA-TM-106258] p 3808 N93-31847
Evaluation of candidate working fluid formulations for the electrothermal-chemical wind tunnel [NASA-CR-193366] p 3684 N93-31848
Assessment of a human computer interface prototyping environment [NASA-CR-192612] p 3784 N93-31849
Wavefront reconstruction from three dimensional intensity measurements [DE93-609881] p 3832 N93-31909
Numerical simulation of the flow in a 1:57-scale axisymmetric model of a large blast simulator [AD-A265551] p 3685 N93-31916
Graphics simulation and training aids for advanced teleoperation p 3793 N93-32119
Knowledge-based simulation using object-oriented programming p 3794 N93-32127
Study of wall heat transfer from a high temperature dissociated hydrogen impinging jet [DE92-017845] p 3698 N93-32184
Interactions between magnetically levitated vehicles and elevated guideway structures [PB93-148542] p 3736 N93-32192
Steady states in the twin-well potential oscillator: Computer simulations and approximate analytical studies [REPT-40/1992] p 3722 N93-32214
A PC-based simulation of the National Transonic Facility's safety microprocessor [NASA-TM-109003] p 3796 N93-32224
Implementation of interconnect simulation tools in spice [NASA-CR-193619] p 3792 N93-32239
The application of remotely sensed data to studies of volcanism within the Galapagos Islands p 3747 N93-32326
Neural network identification of keystream generators [AD-A265778] p 3800 N93-32334
Investigation of advanced technology for airway facilities maintenance training [DOT/FAA/CT-TN92/24] p 3678 N93-32336
Ant system for job-shop scheduling [REPT-92-066] p 3792 N93-32346
Enhanced methods for determining operational capabilities and support costs of proposed space systems [NASA-CR-193265] p 3812 N93-32350

CONDENSED MATTER PHYSICS
Spontaneous regulating mechanisms that may have led to the origin of life [DE93-603677] p 3771 N93-31161

CONDUCTING POLYMERS
Functionalized polymeric materials for electronics and optics [AD-A265788] p 3710 N93-31802

CONDUCTION BANDS
The Optical Stark effect of the exciton due to dynamical coupling between quantized states of the electron and hole in quantum wells [DE93-608520] p 3819 N93-31665

CONDUCTIVE HEAT TRANSFER
Terminal project heat convection in thin cylinders [DE93-609489] p 3723 N93-31245

CONDUCTIVITY
Advanced alternate planar geometry solid oxide fuel cells [DE93-000248] p 3721 N93-32174

CONFERENCES
Computing with neural maps: Application to perceptual and cognitive function [AD-A264092] p 3743 N93-31060
Symposium on Applied Mathematical Programming and Modeling (APMOD93): Volume of extended abstracts [AD-A264091] p 3784 N93-31087
The 1st International Conference on Millimeter Wave and Far-Infrared Technology [AD-A264268] p 3715 N93-31096
GRI proceedings on the Workshop on Plastic Pipe Research Results [PB93-190460] p 3708 N93-31211
Flight test of avionic and air-traffic control systems [ESA-TT-1279] p 3675 N93-31271
The 3rd national heavy precipitation workshop [PB93-186625] p 3767 N93-31329
Structural Integrity and Durability of Reusable Space Propulsion Systems [NASA-CP-10064] p 3692 N93-31552
Study of the Solar-Terrestrial System [ESA-SP-346] p 3852 N93-31674
Targets for Space-Based Interferometry [ESA-SP-354] p 3844 N93-31750
Structure and properties of energetic materials [AD-A265775] p 3713 N93-31800
Air Traffic and Environment [GSF-BAND-8] p 3752 N93-31925
Goddard Conference on Mass Storage Systems and Technologies, volume 2 [NASA-CP-3198-VOL-2] p 3839 N93-31964
Conference: Three Decades of Numerical Linear Algebra at Berkeley [AD-A264964] p 3809 N93-32076
Advances in Analysis and Detection of Explosives. Proceedings of the 4th International Symposium on Analysis and Detection of Explosives [AD-A265002] p 3713 N93-32077
Proceedings: 1991 SO2 Control Symposium, volume 2, sessions 4 and 5A [PB93-196103] p 3754 N93-32090
Proceedings: 1991 SO2 Control Symposium, volume 3, sessions 5B and 6 [PB93-196111] p 3755 N93-32091
Proceedings: 1991 SO2 Control Symposium, volume 4, session 7 [PB93-196129] p 3755 N93-32092
Proceedings: 1991 SO2 Control Symposium, volume 5, session 8 [PB93-196137] p 3755 N93-32093
The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) [NASA-CP-3187-VOL-1] p 3883 N93-32097
Proceedings of the 1991 SO2 Control Symposium, volume 1 [PB93-196095] p 3755 N93-32168
Proceedings of the First Geological Materials Constitutive Modeling Workshop [DE93-009161] p 3765 N93-32176
Video conferencing made easy [DE93-010798] p 3718 N93-32283

CONFIDENCE LIMITS
Measurement uncertainty considerations for coordinate measuring machines [PB93-189819] p 3714 N93-31196

CONFIGURATION MANAGEMENT
Automation and hypermedia technology applications p 3843 N93-32155

CONFINEMENT
Inertial electrostatic confinement as a power source for electric propulsion [NASA-TM-109228] p 3692 N93-31310

CONFORMAL MAPPING
Computing with neural maps: Application to perceptual and cognitive function [AD-A264092] p 3743 N93-31060

CONICAL BODIES
Navier-Stokes computations for kinetic energy projectiles in steady coning motion: A predictive capability for pitch damping [AD-A264111] p 3726 N93-32028

CONIFERS
A scintillation experiment over a forest [KNMI-WR-92-04] p 3746 N93-31595

CONJUGATE GRADIENT METHOD
Iterative equation solving techniques in boundary element analysis p 3802 N93-31141

CONJUGATION
Normal forms of invariant vector fields under a finite group action [DE93-604134] p 3813 N93-31102

CONNECTORS
R and D status report: RF vacuum microelectronics
| AD-A264381 | p 3721 N93-32033
CONSERVATION
Florida's estuaries: A citizen's guide to coastal living and conservation
| PB93-189330 | p 3751 N93-31113
CONSERVATION LAWS
Roe's scheme and the MUSCL technique for the Navier-Stokes equations
| MEMO-1090 | p 3725 N93-31527
Statistical and numerical methods in control and identification
| AD-A264676 | p 3811 N93-32016
CONSISTENCY
Combining qualitative and quantitative spatial and temporal information in a hierarchical structure: Approximate reasoning for plan execution monitoring
p 3835 N93-32132
CONSTITUTIVE EQUATIONS
Some aspects of invariant theory in plasticity. Part 2: Constitutive relations for perfectly locking materials. Comments on perfectly plastic solids
p 3742 N93-32321
CONSTRAINTS
Reduction method with system analysis for multiobjective optimization-based design
| NASA-CR-191456 | p 3803 N93-31194
Scheduling with partial orders and a causal model
p 3835 N93-32130
CONSTRICTIONS
Gas arc constriction for plasma arc welding
| NASA-CASE-MFS-28844-1 | p 3734 N93-31292
CONSTRUCTION
Air Force construction automation/robotics
p 3715 N93-32110
CONTACT LOADS
Contact mechanics and the dynamics of manipulation
p 3733 N93-31103
CONTACT RESISTANCE
Non-destructive, ultra-low resistance, thermally stable contacts for use on shallow junction InP solar cells
| NASA-TM-106228 | p 3750 N93-32201
CONTAMINANTS
Three-dimensional modeling of pollutant transport in surface waters
| PB93-190627 | p 3751 N93-31203
Preferential flow effects on chemical transport and retardation in soils
| PB93-190668 | p 3723 N93-31204
Air quality studies in Albuquerque, New Mexico
| PB93-190817 | p 3751 N93-31212
Chemical dehalogenation treatment: Base-Catalyzed Decomposition Process (BCDP)
| PB93-182939 | p 3751 N93-31432
Geochemical, genetic, and physiological control of pollutant biodegradation
| AD-A264106 | p 3753 N93-32027
Methodology to apportion ambient air measurements to investigate potential effects on air quality near waste incinerators
| PB93-191393 | p 3754 N93-32088
Applications analysis report: Silicate Technology Corporation's solidification/stabilization technology for organic and inorganic contaminants in soils
| PB93-172948 | p 3715 N93-32408
CONTAMINATION
In-situ bioventing: Two US EPA and Air Force sponsored field studies
| PB93-194231 | p 3754 N93-32089
Micromachined chemical sensor with integrated microelectronics
| DE93-013761 | p 3730 N93-32306
Optimization of 15 parameters influencing the long-term survival of bacteria in aquatic systems
| NASA-CR-192571 | p 3772 N93-32365
CONTINENTAL SHELVES
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 1: Executive summary
| PB93-186062 | p 3770 N93-31873
Reconstruction of late Wisconsinan Ice Sheet and sea-level implications p 3758 N93-31879
Benthic study of the continental slope off Cape Hatteras, North Carolina, volume 2
| PB93-186070 | p 3771 N93-32190
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 3: Appendices
| PB93-186088 | p 3771 N93-32308
CONTINUITY (MATHEMATICS)
Existence of viable solutions for nonconvex-valued differential inclusions in Banach spaces
| DE92-644669 | p 3803 N93-31285
Generalised curvature continuous rational cubics
| MATHS-REPT-A-180 | p 3809 N93-32347
CONTINUITY EQUATION
F2D: A two-dimensional compressible gas flow code
| DE93-003239 | p 3723 N93-31169
Characteristics and properties of the continuity equations in a semiconductor
| REPT-92-080 | p 3720 N93-31609
CONTINUOUS WAVE LASERS
Excitation rate and background measurements during LIF studies on krypton
| DE93-013500 | p 3732 N93-32304
CONTOUR SENSORS
A proposal on the quality of the binary thresholds of a contour detection
| REPT-91-075 | p 3806 N93-31544
CONTROL EQUIPMENT
Towards distributed control systems for experiments under micro gravity
| NLR-TP-92027-U | p 3714 N93-32387
CONTROL MOMENT GYROSCOPES
Space Station Freedom attitude determination and control system overview p 3689 N93-31447
CONTROL STABILITY
Global stability of systems of two differential equations with unstationary nonlinearities, 2
| DE92-642558 | p 3802 N93-31072
Dissipation and convergence in the systems of differential equations with unstationary nonlinearities
| DE92-642559 | p 3802 N93-31079
A comparison of force control algorithms for robots in contact with flexible environments
| NASA-CR-193251 | p 3789 N93-31638
Robust stability of second-order systems
| NASA-CR-193624 | p 3809 N93-32373
CONTROL SURFACES
Experiments in the control of wing rock at high angle of attack using tangential leading edge blowing
p 3683 N93-31068
Parametric studies of shock wave/boundary layer interactions over 2D compression corners at Mach 6
| VKI-TN-181 | p 3672 N93-31538
CONTROL SYSTEMS DESIGN
Flight test of avionic and air-traffic control systems
| ESA-TT-1279 | p 3675 N93-31271
Testing concept of a taxiing control system, summary
p 3676 N93-31278
Development and flight testing of a fault-tolerant fly-by-light yaw control system p 3676 N93-31280
EHF military communication satellite alternatives study
| SS/L-TR00775 | p 3716 N93-31311
Terminology and concepts of control and Fuzzy Logic
p 3688 N93-31443
Overview of Fuzzy Logic p 3688 N93-31445
Rendezvous guidance p 3689 N93-31450
Modeling industrial distributed control systems with Petri nets
| REPT-92-079 | p 3714 N93-31465
DIAC at TWI
| REPT-92-77 | p 3787 N93-31472
Neural nets for aligning optical components in harsh environments: Beam smoothing spatial filter as an example p 3693 N93-31557
Design and implementation of fuzzy logic controllers
| NASA-CR-193268 | p 3784 N93-31649
Supervisory autonomous local-remote control system design: Near-term and far-term applications
p 3801 N93-32100
Integration of domain and resource-based reasoning for real-time control in dynamic environments
p 3794 N93-32141
Set-membership identification for robust control design
| AD-A265669 | p 3800 N93-32197
Towards distributed control systems for experiments under micro gravity
| NLR-TP-92027-U | p 3714 N93-32387
CONTROL THEORY
An efficient constrained predictive control algorithm for 2-input systems
| OUEL-1946/92 | p 3785 N93-31152
Characterisation and control of a flexible robot subject to torque ripple
| OUEL-1952/92 | p 3734 N93-31156
Active damping in a flexible manipulator
p 3689 N93-31452
Daily exercise routines p 3689 N93-31455
Atmospheric control systems p 3689 N93-31456
Rotational speed control p 3689 N93-31457
Modeling industrial distributed control systems with Petri nets
| REPT-92-079 | p 3714 N93-31465
The linear quadratic digital control of infinite-dimensional systems with unbounded input and output operators
| REPT-92-49 | p 3798 N93-31483
The optimal projection equations for digital control of infinite-dimensional systems
| REPT-93-01 | p 3799 N93-31851
Optimal fixed-finite-dimensional compensator for Burgers' equation with unbounded input/output operators
| NASA-CR-191454 | p 3808 N93-31857
CONTROL VALVES
Pulse-modulated control of switching valves for an electro-hydraulic servo actuator
| DLR-FB-92-18 | p 3719 N93-31462
CONTROLLERS
Terminology and concepts of control and Fuzzy Logic
p 3688 N93-31443
Tethered systems control p 3689 N93-31453
Robust stabilization of infinite-dimensional systems with respect to coprime factor perturbations
| W-9220 | p 3805 N93-31514
Design and implementation of fuzzy logic controllers
| NASA-CR-193268 | p 3784 N93-31649
Integration of advanced teleoperation technologies for control of space robots p 3784 N93-32107
Integration of domain and resource-based reasoning for real-time control in dynamic environments
p 3794 N93-32141
Fuzzy based attitude controller for flexible spacecraft with on/off thrusters
| NASA-CR-188250 | p 3690 N93-32228
Robust stability of second-order systems
| NASA-CR-193624 | p 3809 N93-32373
Towards distributed control systems for experiments under micro gravity
| NLR-TP-92027-U | p 3714 N93-32387
CONVECTION
A first approximation to the effects of mean flow on sound propagation through cylindrical capillary tubes
| MATHS-REPT-A-181 | p 3815 N93-31599
Distinct ion population in the polar cusp: Possible signature of transient reconnection
p 3766 N93-31680
Magnetospheric convection and current system in the dayside polar cap p 3856 N93-31700
Viking observations of electric fields
p 3858 N93-31712
Radiation/convection coupling in rocket motor and plume analysis
| NASA-CR-193288 | p 3698 N93-31845
Localization and transport in random media
| AD-A264640 | p 3726 N93-32014
CONVECTION CURRENTS
Are there missing convective currents?
| DE93-604672 | p 3825 N93-31084
Thermodynamic structure of subsidence inversions in the Atlantic subtropical anticyclone regime
| AD-A265406 | p 3768 N93-32043
Wind profiling in a cloudy convective atmospheric boundary layer over land
| AD-A265422 | p 3768 N93-32051
Evolution of area-averaged vertical velocity in the convective region of a midlatitude squall line
| AD-A265333 | p 3768 N93-32063
CONVECTION-DIFFUSION EQUATION
Three-dimensional modeling of pollutant transport in surface waters
| PB93-190627 | p 3751 N93-31203
CONVECTIVE FLOW
Evolution of area-averaged vertical velocity in the convective region of a midlatitude squall line
| AD-A265333 | p 3768 N93-32063
CONVECTIVE HEAT TRANSFER
Enhancement of single phase forced convection heat transfer in tubes and ducts using tangential flow injection
| PB93-189975 | p 3723 N93-31210
Terminal project heat convection in thin cylinders
| DE93-609489 | p 3723 N93-31245
Thermodynamic structure of subsidence inversions in the Atlantic subtropical anticyclone regime
| AD-A265406 | p 3768 N93-32043
A p-version finite element method for steady incompressible fluid flow and convective heat transfer
| NASA-TM-106260 | p 3727 N93-32370
CONVERGENCE
Dissipation and convergence in the systems of differential equations with unstationary nonlinearities
| DE92-642559 | p 3802 N93-31079
Finite-dimensional approximation for operator equations of Hammerstein type
| DE93-619669 | p 3809 N93-32286
CONVEXITY
Regularity of stochastic processes: A theory based on directional convexity
| REPT-92-70 | p 3811 N93-31503
CONVOLUTION INTEGRALS
Determination of design and operation parameters for upper atmospheric research instrumentation to yield optimum resolution with deconvolution, appendix 3
| NASA-CR-192835 | p 3766 N93-32231

COOLERS
Experiments on a general thermoacoustic engine
| AD-A265864 | p 3817 N93-32317
COOLING
Thermal control of ice-stream margins
p 3762 N93-31897
COOLING SYSTEMS
Measurements and computational analysis of heat transfer and flow in a simulated turbine blade internal cooling passage
| NASA-TM-106189 | p 3725 N93-31647
COORDINATE TRANSFORMATIONS
Differential small displacements and rotation extensions in three dimensional coordinate systems
| SER-B-295 | p 3804 N93-31338
COORDINATION
Coordination of the solar terrestrial science by the IACG: Inter-Agency Consultative Group for Space Science
p 3852 N93-31675
Co-ordinated data handling for the UK participants in the Cluster mission p 3843 N93-31713
COPOLYMERS
Synthesis and characterization of copolymers of nylon 11 and nylon 12
| AD-A265841 | p 3711 N93-32314
COPPER
A model for predicting high-temperature fatigue failure of a W/Cu composite p 3696 N93-31579
CORES
Lithology and chronology of ice-sheet fluctuations (magnetic susceptibility of cores from the western Ross Sea) p 3759 N93-31880
CORNERS
Fractographic investigation of IMI 685 crack propagation specimens for SMP SC33 p 3681 N93-31743
CORONAGRAPHS
UVCS: The ultraviolet coronograph spectrometer for SOHO p 3868 N93-31349
The Large Angle Spectroscopic Coronagraph (LASCO): Visible light coronal imaging and spectroscopy
p 3868 N93-31350
Ground-based coronagraphic observations of solar streamers p 3870 N93-31358
A model for coronal streamer observations using the SOHO coronagraph instrumentation
p 3870 N93-31361
Modelling the large scale structure of the solar corona
p 3870 N93-31362
Speeds and accelerations of coronal mass ejections
p 3871 N93-31368
Coronagraphic ground based support for SOHO at the Pic-du-Midi Observatory (France) p 3880 N93-31420
Measuring electron temperature in the extended corona p 3880 N93-31422
Coronal mass ejecta and flares: A statistical study
p 3859 N93-31716
CORONAL HOLES
Observational constraints on coronal hole density model p 3871 N93-31364
Solar coronal magnetic structure
p 3852 N93-31676
CORONAL LOOPS
CDS and SUMER observations of fine structure and dynamics of loops: Experience from HRTS
p 3873 N93-31376
Static and dynamic loop models and their observational signatures p 3873 N93-31377
Morphology of coronal loop interactions
p 3873 N93-31379
Active region studies with coordinated SOHO, microwave, and magnetograph observations
p 3873 N93-31380
Thermal profiles of coronal loops: Gravitational considerations p 3873 N93-31381
Mass motion of a heated plasma blob in a coronal loop p 3874 N93-31384
A numerical model of interaction of coronal transients with the solar wind p 3874 N93-31385
What can we learn from the shape of loops?
p 3874 N93-31386
3D reconstruction methods of coronal structures by radio observations p 3874 N93-31387
Dynamic formation and magnetic support of loop or arcade prominences p 3875 N93-31391
Pulse-beam heating in flare loops
p 3875 N93-31392
Temperature dependent morphology of untwisted coronal loops p 3875 N93-31393
Evolution and oscillations of coronal loops
p 3876 N93-31395
Coronal heating: The role of resonant absorption
p 3876 N93-31396
Underneath coronal loops: MSDP observations coordinated with SERTS 4 and NiXT flights
p 3876 N93-31397
The magnetothermal stability of radially stratified line-tied coronal loops p 3876 N93-31400
Observational tests of coronal heating models
p 3877 N93-31403
Very Large Array (VLA) observations of coronal loops
p 3879 N93-31419
Solar coronal magnetic structure
p 3852 N93-31676
On the Bernstein modes generation in solar post-flare loops p 3859 N93-31718
CORONARY ARTERY DISEASE
Cardiovascular Risk Factors (CVRF) in Spanish pilots with coronary artery disease demonstrated by angiographic studies p 3775 N93-32253
Results and management of pathological lipoprotein concentrations and other cardiovascular risk factors in military pilots of the German Federal Armed Forces
p 3775 N93-32254
CORONAS
Coronal shock waves p 3853 N93-31681
CORRELATION
Tracking filters for precision Electronic Support Measures (ESM) systems
| AD-A264089 | p 3719 N93-31085
Viking observations of electric fields
p 3858 N93-31712
Ionospheric control of the long-term occurrence of Pc1 pulsations observed on ground p 3860 N93-31722
CORRIDORS
Maglev guideway route alignment and right-of-way requirements
| PB93-154854 | p 3735 N93-31592
CORROSION PREVENTION
Performance of gas turbine compressor cleaners
| NLR-TP-91237-U | p 3681 N93-31111
CORROSION RESISTANCE
Corrosion-erosion of alloys exposed in fluidised bed combustors
| NPL-DMM(A)-80 | p 3705 N93-31602
Investigation of the electrochemical polarisation behaviour of SiC/6061 Al metal matrix composites
| NPL-DMM(A)-31 | p 3700 N93-31736
Study on the improvement of the properties of Zr alloys
| DE93-605265 | p 3706 N93-31827
Epoxy self-priming topcoats
| AD-D015737 | p 3711 N93-32209
CORROSION TESTS
Accelerated and real-time corrosion testing of aluminum-lithium alloys
| NLR-TP-91203-U | p 3707 N93-32385
CORRUGATING
Active control of flow induced resonance in continuous corrugated tubes
| AD-A265782 | p 3727 N93-32310
COSMIC PLASMA
Multicomponent double layers
| TRITA-ALP-92-03 | p 3825 N93-31542
COSMOLOGY
Gravitation of global topological defects
p 3757 N93-31130
Constraints on cosmic strings due to black holes formed from collapsed cosmic string loops
| NASA-CR-193248 | p 3861 N93-31837
COST ANALYSIS
Minimize system cost by choosing optimal subsystem reliability and redundancy
| NASA-TM-106251 | p 3812 N93-31145
Maglev guideway route alignment and right-of-way requirements
| PB93-154854 | p 3735 N93-31592
Evaluation of future space transportation systems with regard to their reliability and costs
| ESA-TT-1281 | p 3687 N93-31593
Low cost guideways to Maglev
| PB93-154847 | p 3735 N93-31727
COST EFFECTIVENESS
Cost-effectiveness analysis of txDOT LPG fleet conversion, volume 1
| PB93-186492 | p 3712 N93-31326
Cost-effectiveness analysis of txDOT LPG fleet conversion, volume 2
| PB93-186500 | p 3713 N93-31327
Software engineering p 3794 N93-32154
COST ESTIMATES
Low cost guideways to Maglev
| PB93-154847 | p 3735 N93-31727
COST REDUCTION
Preliminary study on costs needed for solution of the global environmental problem
| DE93-768474 | p 3754 N93-32039
Generation and exploration of aggregation abstractions for scheduling and resource allocation
p 3835 N93-32128
Antenna size, transmitter power, and solid state transmitter considerations in affordable radar design
| AD-A264397 | p 3718 N93-32414
COSTS
Instigation and processing of flight tests in DLR
p 3675 N93-31275
Automated Assembly Center (AAC)
p 3686 N93-32123
COULOMB COLLISIONS
Coulomb-blockade oscillations in quantum dots and wires
| ETN-93-94055 | p 3831 N93-31621
Kinetic nonlinear electron-ion two stream instability in field-free isothermal plasma
| DE93-608571 | p 3826 N93-31668
COULOMB POTENTIAL
Calculations of wavefunctions and energies of electron system in Coulomb potential by variational method without a basis set
| DE93-608161 | p 3819 N93-31286
Perturbation of the Laplacian by the Coulomb potential and a point interaction in L(sup p)(R cubed)
| REPT-92-55 | p 3807 N93-31613
COUNTERMEASURES
Fix-tracking system
| AD-D015738 | p 3718 N93-32210
COUPLED MODES
Modal synthesis technique used in shallow doublewall
| FFA-TN-1992-29 | p 3722 N93-31053
COUPLING
Instabilities and nonstatistical behavior in globally coupled systems
| DE93-608185 | p 3831 N93-31302
CRACK INITIATION
Conclusions and recommendations
p 3682 N93-31749
CRACK PROPAGATION
Perforated carbon-epoxy plates damage modeling for quasi-static biaxial loading
| ESA-TT-1273 | p 3740 N93-31428
AGARD Engine Disc Cooperative Test Programme
| AGARD-R-766-ADD | p 3681 N93-31741
Fractographic and microstructural analysis of fatigue crack growth in Ti-6Al-4V fan disc forgings
p 3681 N93-31742
Fractographic investigation of IMI 685 crack propagation specimens for SMP SC33 p 3681 N93-31743
Fatigue crack growth results for Ti-6Al-4V, IMI 685, and Ti-17 p 3682 N93-31746
Crack growth prediction models p 3682 N93-31747
Crack growth prediction results p 3682 N93-31748
Conclusions and recommendations
p 3682 N93-31749
Study of improved critical currents and mechanical properties in YBaCuO superconductor with Ag or 211
| AD-A265749 | p 3829 N93-31804
Damage severity of monitored fatigue load spectra
| NLR-TP-92009-U | p 3679 N93-32205
CRACKING (FRACTURING)
Thermal shock and fatigue behavior of ceramic tubes
p 3739 N93-31139
CRACKS
Internal structural characterization
| AD-A264762 | p 3738 N93-31982
CRASHES
Aircraft accident report: Takeoff stall in icing conditions, USAir Flight 405, Fokker F-28, N485US, LaGuardia Airport, Flushing, New York, 22 March 1992
| PB93-910402 | p 3674 N93-32195
Aircraft accident report: Controlled collision with terrain GP Express Airlines, Inc., Flight 861, a Beechcraft C99, N118GP, Anniston, Alabama, 8 June 1992
| PB93-910403 | p 3674 N93-32196
CREEP RUPTURE STRENGTH
Stress-rupture behavior of small diameter polycrystalline alumina fibers
| NASA-TM-106256 | p 3712 N93-32382
CREW WORKSTATIONS
Abridged procedural guide to aircrew anthropometric accommodation assessment
| AD-A265220 | p 3777 N93-32006
CRITICAL TEMPERATURE
High temperature superconducting films and multilayers for electronics
| AD-A264410 | p 3828 N93-31190
CROSS CORRELATION
Progress in speckle-shift strain measurement
p 3693 N93-31558
Surface velocity fields of Ice Streams D and E derived from repeat satellite imagery p 3760 N93-31890
CROSS FLOW
On the dynamics of aeroelastic oscillators with one degree of freedom
| REPT-92-96 | p 3815 N93-31653

CROSSLINKING
Ion exchange polymers and method for making
[NASA-CASE-LEW-15576-1] p 3709 N93-31316
Photoconductivity and photovoltage generation in novel photocrosslinkable nonlinear optical polymers
[AD-A265780] p 3719 N93-32417
CROSSTALK
Pulse discriminator for crosstalk rejection in a multi-channel isochromat photoemission spectroscopy
[REPT-92-062] p 3719 N93-31253
An investigation of the channel crosstalk in optical heterodyne controlled phased array radars
[AD-A265412] p 3717 N93-32046
CRUDE OIL
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 1: Executive summary
[PB93-186062] p 3770 N93-31873
Benthic study of the continental slope off Cape Hatteras, North Carolina, volume 2
[PB93-186070] p 3771 N93-32190
CRYOGENIC COOLING
Experiments on a general thermoacoustic engine
[AD-A265864] p 3817 N93-32317
CRYOGENIC EQUIPMENT
Design review of fluid film bearing testers
[NASA-CR-193299] p 3735 N93-31731
Experiments on a general thermoacoustic engine
[AD-A265864] p 3817 N93-32317
CRYOGENIC FLUIDS
Design review of fluid film bearing testers
[NASA-CR-193299] p 3735 N93-31731
CRYOGENIC WIND TUNNELS
A PC-based simulation of the National Transonic Facility's safety microprocessor
[NASA-TM-109003] p 3796 N93-32224
CRYOGENICS
SQUIDs in thermal detectors of weakly interacting particles
[DE93-609531] p 3729 N93-31247
CRYPTOGRAPHY
Neural network identification of keystream generators
[AD-A265778] p 3800 N93-32334
CRYSTAL DEFECTS
Effects of surface defects on the local electric field in inhomogeneous media
[DE93-011035] p 3830 N93-32182
CRYSTAL GROWTH
HREM study of crystallography of titanium and titanium hydride thin films
[DE93-609038] p 3828 N93-31176
Thermodynamic analysis of processes proceeding on (111) faces of diamond during chemical vapour deposition
[DE93-609039] p 3708 N93-31177
Secondary orientation effects in a single crystal superalloy under mechanical and thermal loads
p 3696 N93-31578
Microstructural studies of ceramic thermal carrier coatings; how it influences coatings thermomechanical resistance
[ONERA-NT-1992-9] p 3709 N93-31597
Prometheus in space: Survey report of Research Committee on Functional New Material
p 3710 N93-31728
CRYSTAL LATTICES
On the magnetoresistance of heavy fermion compounds
[DE93-608691] p 3827 N93-31098
Biharmonic pattern selection
[DE93-608186] p 3803 N93-31303
Scattering of electrons at heterostructure interfaces
[ETN-93-94044] p 3828 N93-31523
CRYSTAL OPTICS
Adaptive optics for high power beam lines using diamond crystal monochromators
[DE93-009328] p 3824 N93-31987
CRYSTAL STRUCTURE
NMR studies of organic thin films
[AD-A264903] p 3707 N93-31066
Hierarchical textures in ferroelectric crystals
[DE93-608938] p 3827 N93-31175
NTO polymorphs
[DE93-005451] p 3712 N93-31186
Liquid-crystalline main-chain polymers with flexible side chains: Synthesis, structure, processing and properties of poly(p-phenylene terephthalate)s with alkoxy side chains
[ETN-93-94041] p 3709 N93-31520
Secondary orientation effects in a single crystal superalloy under mechanical and thermal loads
p 3696 N93-31578
Pressure induced topological phase transitions in membranes
[AD-A265212] p 3829 N93-32002
Fundamental studies of new high-energy permanent magnet materials
[DE93-014707] p 3815 N93-32291
Structural characterization of nylon 7 by solid-state NMR, DSC, and ATR-FTIR
[AD-A265800] p 3822 N93-32312
CRYSTALLINITY
Structural characterization of nylon 7 by solid-state NMR, DSC, and ATR-FTIR
[AD-A265800] p 3822 N93-32312
CRYSTALLOGRAPHY
HREM study of crystallography of titanium and titanium hydride thin films
[DE93-609038] p 3828 N93-31176
CRYSTALS
On the magnetoresistance of heavy fermion compounds
[DE93-608691] p 3827 N93-31098
Nonlinear response function for two-phonon polaritons
[DE93-608692] p 3817 N93-31099
Exciton solitary waves in molecular crystals
[DE93-608693] p 3827 N93-31100
Dehydroxylated clay silicates on Mars: Riddles about the Martian regolith solved with ferrian saponites
p 3862 N93-31937
CUES
Auditory spectro-temporal pattern analysis
[AD-A264691] p 3773 N93-31981
CULTURE (SOCIAL SCIENCES)
The Impact of Changing International Relations on the Scientific and Technical Community
[AGARD-CP-523] p 3836 N93-31215
CUMULATIVE DAMAGE
Cumulative fatigue damage behavior of MAR M-247
p 3696 N93-31575
CURRENT ALGEBRA
BRST quantization of 2D-Yang Mills theory with anomalies
[NIKHEF-H/92-13] p 3831 N93-31122
On two-current realization of KP hierarchy
[DE93-609917] p 3808 N93-31912
CURRENT DENSITY
Study of improved critical currents and mechanical properties in YBaCuO superconductor with Ag or 211
[AD-A265749] p 3829 N93-31804
Numerical studies of low temperature gallium arsenide buffer layers and their influence on device operation
[AD-A264296] p 3829 N93-32083
CURRENT SHEETS
Heliospheric current sheet effects on the propagation of solar-generated shock waves p 3854 N93-31685
Collisionless magnetotail reconnection and substorms
p 3856 N93-31698
CURVATURE
On the scalar curvature of self-dual manifolds
[DE93-608194] p 3804 N93-31306
A remark about the mean curvature
[DE93-619668] p 3809 N93-32285
CURVED BEAMS
Vibrational power transmission in curved beams. Part 1: Theory
[ISVR-TR-208] p 3742 N93-32340
CURVES (GEOMETRY)
Generalised curvature continuous rational cubics
[MATHS-REPT-A-180] p 3809 N93-32347
CUTTERS
Cutting parameters with Lasag lasers
[DE93-010403] p 3732 N93-32288
CYCLES
A generalized asymptoticity problem in max algebra, the general case
[REPT-92-76] p 3804 N93-31471
Mean seasonal cycles and interannual variations at 0 deg, 165 deg E during 1986-1992
[PB93-186195] p 3768 N93-31874
Cycles in tough graphs: Updating the last four years
[MEMO-1091] p 3810 N93-32398
A note on dominating cycles in 2-connected graphs
[MEMO-1094] p 3810 N93-32401
CYCLIC COMPOUNDS
The effect of alkyl substituents on the macrocycle ring on enantiomeric recognition by chiral pyridino-18-crown-6 for 1-naphthylethylamine
[AD-A265513] p 3704 N93-31918
CYCLIC HYDROCARBONS
Molecular dynamical and structural studies for the bakelite by neutron cross section measurements
[DE93-609444] p 3819 N93-31244
Geochemical, genetic, and physiological control of pollutant biodegradation
[AD-A264106] p 3753 N93-32027
CYCLIC LOADS
Structural dynamics: Probabilistic structural analysis methods. Program overview p 3694 N93-31562
Low cycle fatigue behaviour of titanium disc alloys
p 3682 N93-31745
CYCLOGENESIS
Tropical cyclone forecasters reference guide, No. 3: Tropical cyclone formation
[AD-A265216] p 3768 N93-32005
CYCLONES
Advances in dynamical predictions and modelling of tropical cyclone motion
[AD-A264500] p 3767 N93-31195
Tropical cyclone forecasters reference guide, No. 3: Tropical cyclone formation
[AD-A265216] p 3768 N93-32005
CYCLOTRON RADIATION
Report of the working group on far field accelerators
[AD-A265443] p 3732 N93-32021
CYCLOTRON RESONANCE
An electron cyclotron resonance plasma process for InP passivation
[AD-A265036] p 3826 N93-31998
Report of the working group on far field accelerators
[AD-A265443] p 3732 N93-32021
Infrared multiple photon dissociation spectra of gaseous ions
[AD-A264378] p 3821 N93-32032
CYCLOTRONS
Quantum adiabatic expansion for dynamics in strong magnetic fields
[DE93-609388] p 3831 N93-31226
Calibration of a detector system for solar energetic particles analysis p 3860 N93-31721
CYLINDRICAL SHELLS
Terminal project heat convection in thin cylinders
[DE93-609489] p 3723 N93-31245

D

DAMAGE
Remote surface inspection system
p 3739 N93-32099
An overview of the Kennedy Space Center robotics program p 3691 N93-32124
DAMAGE ASSESSMENT
On the feasibility of a transient dynamic design analysis
[AD-A264882] p 3733 N93-31101
Perforated carbon-epoxy plates damage modeling for quasi-static biaxial loading
[ESA-TT-1273] p 3740 N93-31428
Constitutive and damage material modeling in a high pressure hydrogen environment p 3696 N93-31577
Examination of the effect of propulsion system performance variables on the life prediction for the SSME Lox Post p 3697 N93-31580
Life extending control: An interdisciplinary engineering thrust p 3697 N93-31581
Reportable accidents to UK registered aircraft, and to foreign registered aircraft in UK airspace, 1990
[CAP-600] p 3674 N93-31730
Damage severity of monitored fatigue load spectra
[NLR-TP-92009-U] p 3679 N93-32205
DAMPING
Navier-Stokes computations for kinetic energy projectiles in steady coning motion: A predictive capability for pitch damping
[AD-A264111] p 3726 N93-32028
DARK MATTER
Sterile neutrinos as dark matter
[DE93-012533] p 3822 N93-32294
DATA ACQUISITION
The basic measurement equipment of the DLR test aircraft p 3675 N93-31273
Attention focussing and anomaly detection in real-time systems monitoring p 3730 N93-32139
Near bottom data collection and data analysis
[AD-A265872] p 3771 N93-32172
Fast Fourier Transform analysis of computer-acquired friction data
[DE93-010337] p 3736 N93-32179
Personal information management in computer science research
[ISBN-0-315-73783-2] p 3842 N93-32325
DATA BASE MANAGEMENT SYSTEMS
Investigations into database management system support for expert system shells, volumes 1 and 2
p 3835 N93-31108
Deriving incremental production rules for deductive data
[REPT-92-081] p 3787 N93-31466
Recent developments in database management
[REPT-92-61] p 3838 N93-31498
The performance of integrity control through transaction modification in a parallel main-memory database system
[MEMO-INF-92-54] p 3839 N93-31615
Automation and hypermedia technology applications
p 3843 N93-32155

DATA BASES
An intelligent knowledge system for selection of materials for critical aerospace applications (IKSMAT), phase 2
[AD-A263394] p 3835 N93-31078
The management of replicated data
p 3836 N93-31144
Integrated access to distributed databases through intelligent interfaces p 3837 N93-31218
End users: New products and services
p 3837 N93-31220
Spatial relational algebra: An extended relational algebra for spatial database
[REPT-92-051] p 3786 N93-31249
European Road Database: Activities within the ATKIS
p 3744 N93-31257
Access and content of the EDBS topographic-cartographic information system (ATKIS)
p 3745 N93-31267
Modernization and new technologies: Coping with the information explosion
[NASA-TM-109410] p 3838 N93-31315
Managing semantic heterogeneity with production rules and persistent queues
[REPT-92-078] p 3811 N93-31464
Recent developments in database management
[REPT-92-61] p 3838 N93-31498
Quality support tool of simulation models: A comparison between methodology
[REPT-92-061/BIS] p 3839 N93-31605
On the selection of an optimal set of secondary indices
[MEMO-INF-92-68] p 3789 N93-31617
Crack growth prediction models p 3682 N93-31747
Formal specification and verification of concurrent programs
[AD-A265201] p 3790 N93-31793
Current state of the mass storage system reference model p 3840 N93-31965
Measurements over distributed high performance computing and storage systems p 3841 N93-31977
Venari/ML interfaces and examples
[AD-A265416] p 3841 N93-32048
An on-line expert system for diagnosing environmentally induced spacecraft anomalies using CLIPS
p 3794 N93-32142
Producing approximate answers to database queries
p 3843 N93-32150
Cooperative answers in database systems
p 3843 N93-32153
The Knowledge-Based Software Assistant: Beyond CASE p 3794 N93-32156
Ceramic technology project database
[DE93-012429] p 3710 N93-32161
Automatic Target Recognition (ATR) using Distributed Associative Memories (DAMS)
[AD-A265613] p 3800 N93-32169
Internation aircraft operator information system
[DOT/FAA/CT-93/4] p 3671 N93-32232
User friendly database for Neptune planetary radio astronomy observations
[NASA-CR-193261] p 3851 N93-32324

DATA COMPRESSION
Fractal image coding techniques and contraction operators
[REPT-92-93] p 3789 N93-31632
Remote driving with reduced bandwidth communication p 3719 N93-32114

DATA FLOW ANALYSIS
Assuring type safety of object-oriented languages
[REPT-92-061] p 3787 N93-31252
Access and content of the EDBS topographic-cartographic information system (ATKIS)
p 3745 N93-31267
Z through pictures
[RSRE-MEMO-4587] p 3787 N93-31337
Conception of a modular real-time system for laser remote sensing with particular consideration of upward compatibility
[SER-C-378] p 3731 N93-31340
Intelligent assistance in scientific data preparation
p 3843 N93-32144
The reuse of large-scale components
[REPT-92-95] p 3793 N93-32419

DATA INTEGRATION
Hybrid rendering of scientific data using an h-buffer
[REPT-92-68] p 3788 N93-31495
Attention focussing and anomaly detection in real-time systems monitoring p 3730 N93-32139

DATA LINKS
Process control and recovery in the Link Monitor and Control Operator Assistant p 3719 N93-32145

DATA MANAGEMENT
The management of replicated data
p 3836 N93-31144
Manual for data administration
[PB93-182053] p 3834 N93-31431
Recent developments in database management
[REPT-92-61] p 3838 N93-31498
Quality support tool of simulation models: A comparison between methodology
[REPT-92-061/BIS] p 3839 N93-31605
Co-ordinated data handling for the UK participants in the Cluster mission p 3843 N93-31713
An overview of PCTE: A basis for a Portable Commo n Tool Environment
[AD-A265202] p 3791 N93-32000
Petite amateur naval satellite spacecraft digital control system: A hardware design
[AD-A265234] p 3690 N93-32061
User friendly database for Neptune planetary radio astronomy observations
[NASA-CR-193261] p 3851 N93-32324

DATA PROCESSING
Automatic acquisition of elevation points in map-making using the TUEK 200 p 3745 N93-31263
Accuracy estimation for digitizing
p 3745 N93-31265
The basic measurement equipment of the DLR test aircraft p 3675 N93-31273
Instigation and processing of flight tests in DLR
p 3675 N93-31275
Bayesian analysis of SOHO spectra
p 3876 N93-31398
Towards a new approach to autonomous navigation for a vehicle: A link between probability data association filtering and the evidence theory
[ONERA-NT-1990-11] p 3798 N93-31427
Deriving incremental production rules for deductive data
[REPT-92-081] p 3787 N93-31466
Hybrid rendering of scientific data using an h-buffer
[REPT-92-68] p 3788 N93-31495
The standards process: X3 information processing systems p 3840 N93-31966
Architectural assessment of mass storage systems at GSFC p 3841 N93-31980
Near bottom data collection and data analysis
[AD-A265872] p 3771 N93-32172
A plotting system for three-dimensional oblique coordinates (triangular mesh) of CITATION
[DE92-526848] p 3792 N93-32185
Experimental analysis of computer system dependability
[NASA-CR-193401] p 3785 N93-32233
An automated processing system for food frequency and nutrition knowledge questionnaire p 3778 N93-32241
Remotely sensed data from space. Distribution, pricing, and applications: An OTA background paper
[PB93-176964] p 3747 N93-32309

DATA PROCESSING EQUIPMENT
Goddard Conference on Mass Storage Systems and Technologies, volume 2
[NASA-CP-3198-VOL-2] p 3839 N93-31964
The standards process: X3 information processing systems p 3840 N93-31966

DATA RECORDERS
National Media Laboratory: Media testing results
p 3840 N93-31972

DATA RECORDING
Goddard Conference on Mass Storage Systems and Technologies, volume 2
[NASA-CP-3198-VOL-2] p 3839 N93-31964
Ultra-high density recording technologies
p 3840 N93-31971
National Media Laboratory: Media testing results
p 3840 N93-31972
Data storage: Retrospective and prospective
p 3841 N93-31976
The redwood project: An overview
p 3841 N93-31979

DATA REDUCTION
Testing of an experimental system for image reconnaissance p 3677 N93-31283
Intelligent assistance in scientific data preparation
p 3843 N93-32144
Near bottom data collection and data analysis
[AD-A265872] p 3771 N93-32172

DATA STORAGE
Testing of an experimental system for image reconnaissance p 3677 N93-31283
Recent developments in database management
[REPT-92-61] p 3838 N93-31498
Goddard Conference on Mass Storage Systems and Technologies, volume 2
[NASA-CP-3198-VOL-2] p 3839 N93-31964
Current state of the mass storage system reference model p 3840 N93-31965
Recording and wear characteristics of 4 and 8 mm helical scan tapes p 3730 N93-31969
Ultra-high density recording technologies
p 3840 N93-31971
National Media Laboratory: Media testing results
p 3840 N93-31972
Grand challenges in mass storage: A system integrator's perspective p 3840 N93-31973
Electron trapping optical data storage system and applications p 3730 N93-31975
Data storage: Retrospective and prospective
p 3841 N93-31976
Architectural assessment of mass storage systems at GSFC p 3841 N93-31980

DATA STRUCTURES
Computing with neural maps: Application to perceptual and cognitive function
[AD-A264092] p 3743 N93-31060
Knowledge-based software development tools
[AD-A265218] p 3791 N93-32059
Data communication network at the ASRM facility
[NASA-CR-193625] p 3686 N93-32236
High performance FORTRAN without templates: An alternative model for distribution and alignment
[NASA-CR-191451] p 3792 N93-32323

DATA SYSTEMS
The implementation of the digital wave processor for the ESA/NASA Cluster mission p 3858 N93-31708
Auroral Cluster: Science objectives and measurement strategies p 3858 N93-31710
Co-ordinated data handling for the UK participants in the Cluster mission p 3843 N93-31713
Distributed data systems in space physics
p 3859 N93-31715
Crack growth prediction models p 3682 N93-31747
Accessing Earth science data from the EOS data and information system p 3840 N93-31968
Enhancements to the Engine Data Interpretation System (EDIS)
[NASA-CR-193363] p 3800 N93-32230
User friendly database for Neptune planetary radio astronomy observations
[NASA-CR-193261] p 3851 N93-32324

DATA TRANSFER (COMPUTERS)
Scheduling data transfers in parallel computers and communications systems p 3836 N93-31132

DATA TRANSMISSION
Test measurements for quick analog digital converters for an x ray CCD camera
[ETN-93-94204] p 3728 N93-31119
The basic measurement equipment of the DLR test aircraft p 3675 N93-31273
Testing of an experimental system for image reconnaissance p 3677 N93-31283
Data communication network at the ASRM facility
[NASA-CR-193625] p 3686 N93-32236

DE BROGLIE WAVELENGTHS
Free Maxwell equations, Dirac equation, and non-dispersive De Broglie wave packets
[DE93-609848] p 3832 N93-31908
Proposal for an absolute, atomic definition of mass
[DE93-609842] p 3815 N93-32410

DEBONDING (MATERIALS)
Compressive strengths of fiber-reinforced composites with interface debonding p 3699 N93-31136

DECISION MAKING
Development of a case tool to support decision based software development
[NASA-CR-193289] p 3790 N93-31738
Combining qualitative and quantitative spatial and temporal information in a hierarchical structure: Approximate reasoning for plan execution monitoring
p 3835 N93-32132
Massively parallel support for a case-based planning system p 3797 N93-32135
Strategic management: Managing change by managing participation
[AD-A265796] p 3834 N93-32311

DECISION THEORY
Decision-theoretic control of EUVE telescope scheduling p 3835 N93-32134
Decision theory for computing variable and value ordering decisions for scheduling problems
p 3835 N93-32137
Using machine learning techniques to automate sky survey catalog generation p 3843 N93-32143
A decision-theoretic approach to the display of information for time-critical decisions: The Vista project
p 3784 N93-32152

DECODING
Trellis coded modulation applied to orthogonal signals
[AD-A265232] p 3717 N93-32060

DECOMMUTATORS
Ground installations for preparation and evaluation of flight tests p 3675 N93-31274

DECOMPOSITION
Symposium on Applied Mathematical Programming and Modeling (APMOD93): Volume of extended abstracts
[AD-A264091] p 3784 N93-31087
Chemical dehalogenation treatment: Base-Catalyzed Decomposition Process (BCDP)
[PB93-182939] p 3751 N93-31432
Lie bialgebras with triangular decomposition
[DE93-604232] p 3808 N93-31820

DECOMPRESSION SICKNESS
Hyperbaric treatment p 3689 N93-31454

DECOUPLING
Disturbance decoupling by measurement feedback for structured systems: A graph theoretical approach
[REPT-92-53] p 3805 N93-31487
Graph theoretic methods for the computation of disturbance decoupling feedback matrices for structured systems
[REPT-92-54] p 3789 N93-31614
Nonlinear disturbance decoupling and linearization: A partial interpretation of integral feedback
[MEMO-1093] p 3801 N93-32400

DEDUCTION
The position test: A computer generated process for acquisition of inductive logic thinking
p 3775 N93-31232
Weak equivalence: Theory and applications
[CT-92-02] p 3788 N93-31529

DEEP SPACE NETWORK
Process control and recovery in the Link Monitor and Control Operator Assistant p 3719 N93-32145

DEFECTS
An intelligent knowledge system for selection of materials for critical aerospace applications (IKSMAT), phase 2
[AD-A263394] p 3835 N93-31078
Optimal design and imperfection sensitivity of nonlinear shell structures
[FFA-TN-1992-30] p 3739 N93-31123
Internal structural characterization
[AD-A264762] p 3738 N93-31982
Remote surface inspection system
p 3739 N93-32099

DEFENSE PROGRAM
The Army and military in space
[AD-A264581] p 3812 N93-32013
Air Force construction automation/robotics
p 3715 N93-32110
The applicability and availability of Former Soviet Union (FSU) space-related capabilities and facilities to energy-related space activities of Department of Energy, Department of Defense and National Aeronautics and Space Administration
[DE93-010286] p 3686 N93-32178

DEFLECTION
Advanced aircraft with thrust vector control
[MBB-FE-1-S-PUB-0504] p 3678 N93-31043

DEFORESTATION
Central Africa: Global climate change and development
[PB93-179612] p 3768 N93-31871
Study on new biomass energy systems
[DE93-768470] p 3749 N93-32057

DEFORMATION
Multiparametric quantum symplectic phase space
[DE93-604081] p 3802 N93-31162
A thermoelastic model for thick composite rings
[AD-A264112] p 3701 N93-32029
Land subsidence and problems affecting land use at Edwards Air Force Base and vicinity, California, 1990
[PB93-182236] p 3765 N93-32191

DEGASSING
Chemical transport during formation and alteration of Martian impact and volcanic deposits
p 3865 N93-31953

DEGRADATION
Surface degradation of polymeric materials
[NPL-DMM(A)-75] p 3709 N93-31323
DLTS and dynamic transconductance analysis of deep-submicron fully-depleted SOI MOSFETs
[AD-A264888] p 3721 N93-31984

DEHYDROGENATION
Thermodynamic analysis of processes proceeding on (111) faces of diamond during chemical vapour deposition
[DE93-609039] p 3708 N93-31177
New directions for the catalytic conversion of methane
[PB93-188795] p 3702 N93-31435

DELAMINATING
Internal structural characterization
[AD-A264762] p 3738 N93-31982

DELTA FUNCTION
Benet improvements made on Los Alamos electromagnetic field code
[AD-A265474] p 3718 N93-32065

DELTA WINGS
Supersonic aerodynamic characteristics of an advanced F-16 derivative aircraft configuration
[NASA-TP-3355] p 3673 N93-31733

DENSE PLASMAS
Momentum transport through the chromosphere
p 3852 N93-31677

DENSITY DISTRIBUTION
Three-neutrino oscillations in matter and topological phases
[DE93-608386] p 3813 N93-31290
Modelling the large scale structure of the solar corona
p 3870 N93-31362
A magnetostatic coronal model with horizontal electric currents: Modeling the coronal streamer belt
p 3871 N93-31366
Models of coronal streamers at meter-decameter wavelengths p 3872 N93-31374
Mass motion of a heated plasma blob in a coronal loop p 3874 N93-31384

DEOXYRIBONUCLEIC ACID
Mechanisms of microwave induced damage in biologic materials
[AD-A264415] p 3772 N93-32035
Genetic algorithms for DNA sequence assembly
[DE93-012708] p 3792 N93-32299

DEPOSITION
Non-destructive, ultra-low resistance, thermally stable contacts for use on shallow junction InP solar cells
[NASA-TM-106228] p 3750 N93-32201

DESIGN ANALYSIS
On the feasibility of a transient dynamic design analysis
[AD-A264882] p 3733 N93-31101
Analysis of the compliant motion achievable with an industrial robot: Identification, feedback and design
[OUEL-1899/91] p 3733 N93-31150
The microwave radiometer as a remote sensing device: Design and application
[ISBN-9-09-005507-X] p 3746 N93-31537
Advanced launch system multi-path redundant avionics architecture analysis and characterization
[NASA-CR-4516] p 3795 N93-31642
The implementation of the digital wave processor for the ESA/NASA Cluster mission p 3858 N93-31708
Low cost guideways to Maglev
[PB93-154847] p 3735 N93-31727
Design review of fluid film bearing testers
[NASA-CR-193299] p 3735 N93-31731
RATLER: Robotic All-Terrain Lunar Exploration Rover
p 3737 N93-32117
Aeronautical engineering: A continuing bibliography with indexes (supplement 292)
[NASA-SP-7037(292)] p 3671 N93-32375

DESIGN TO COST
Low cost guideways to Maglev
[PB93-154847] p 3735 N93-31727

DESORPTION
Si atomic layer epitaxy based on Si2H6 and remote He plasma bombardment
[DE93-011674] p 3830 N93-32183

DESULFURIZING
Proceedings: 1991 SO2 Control Symposium, volume 2, sessions 4 and 5A
[PB93-196103] p 3754 N93-32090
Proceedings: 1991 SO2 Control Symposium, volume 3, sessions 5B and 6
[PB93-196111] p 3755 N93-32091
Proceedings: 1991 SO2 Control Symposium, volume 4, session 7
[PB93-196129] p 3755 N93-32092
Proceedings: 1991 SO2 Control Symposium, volume 5, session 8
[PB93-196137] p 3755 N93-32093
Proceedings of the 1991 SO2 Control Symposium, volume 1
[PB93-196095] p 3755 N93-32168

DETECTION
Advances in Analysis and Detection of Explosives. Proceedings of the 4th International Symposium on Analysis and Detection of Explosives
[AD-A265002] p 3713 N93-32077
Fire protection for launch facilities using machine vision fire detection p 3687 N93-32113

DETONATION
Structure and properties of energetic materials
[AD-A265775] p 3713 N93-31800

DETONATION WAVES
The performance of PAGOSA on several MIMD parallel computers
[DE93-003243] p 3786 N93-31183
Analytical and experimental investigations of the oblique detonation wave engine concept
[NASA-TM-102839] p 3683 N93-32374

DEUTERIUM
Infrared spectroscopy of hydrogen and water on diamond (100)
[AD-A265531] p 3704 N93-31920

DEVELOPING NATIONS
The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 3, part 2
[PB93-174811] p 3748 N93-31105
Indigenous views of land and the environment
[PB93-186898] p 3755 N93-32166
Information systems strategies for public financial management
[PB93-186948] p 3842 N93-32167

DIAGNOSIS
Fundamental diagnostic hematology: Anemia (second edition)
[PB93-188662] p 3773 N93-31140
Fundamental diagnostic hematology: The bleeding and clotting disorders (second edition)
[PB93-188670] p 3773 N93-31158
Implementing a real time reasoning system for robust diagnosis p 3739 N93-32138
Process control and recovery in the Link Monitor and Control Operator Assistant p 3719 N93-32145

DIAGRAMS
Z through pictures
[RSRE-MEMO-4587] p 3787 N93-31337

DIAMETERS
Smallest regular graphs with given diameter
[MEMO-1092] p 3810 N93-32399

DIAMOND FILMS
Thermodynamic analysis of processes proceeding on (111) faces of diamond during chemical vapour deposition
[DE93-609039] p 3708 N93-31177
Investigation of diamond homoepitaxy by in situ Fizeau interferometry: The role of oxygen
[AD-A265544] p 3829 N93-31921

DIAMONDS
Carbon diffusion in uncoated and titanium nitride coated iron substrates during microwave plasma assisted chemical vapor deposition of diamond
[DE93-608934] p 3708 N93-31174
Thermodynamic analysis of processes proceeding on (111) faces of diamond during chemical vapour deposition
[DE93-609039] p 3708 N93-31177
Investigation of carbon near the graphite-diamond-liquid triple point
[DE93-609052] p 3708 N93-31178
Infrared spectroscopy of hydrogen and water on diamond (100)
[AD-A265531] p 3704 N93-31920
Investigation of diamond homoepitaxy by in situ Fizeau interferometry: The role of oxygen
[AD-A265544] p 3829 N93-31921
Adaptive optics for high power beam lines using diamond crystal monochromators
[DE93-009328] p 3824 N93-31987
Progress toward atomic layer epitaxy of diamond using radical chemistry
[AD-A265409] p 3829 N93-32045

DICTIONARIES
List of acronyms in environmental sciences
[KNMI-PUBL-180-ED-1] p 3838 N93-31596

DIELECTRIC PROPERTIES
Sensor fusion for assured vision in space applications
p 3824 N93-32105

DIELECTRICS
Determination of the electrostatic Green's function for stratified media
[REPT-92-067] p 3716 N93-31607
Numerical analysis of the spectral domain of transmission lines in dielectric layers
[REPT-92-068] p 3716 N93-31608
Effects of surface defects on the local electric field in inhomogeneous media
[DE93-011035] p 3830 N93-32182

DIESEL FUELS
Making clean gasoline: The effect on jet fuels
[AD-A264302] p 3713 N93-32085

DIETS
An automated processing system for food frequency and nutrition knowledge questionnaire p 3778 N93-32241
Nutritional assessment of United States tactical air command pilots p 3778 N93-32242
Protein requirements in hypoxia or hypokinesia
p 3778 N93-32244
Correlation of life-style and dietary concomitants of Greek pilots with serum analytes p 3780 N93-32256
The lifestyle and dietary consumption patterns of United States Air Force aviators within air training command at Randolph Air Force Base, Texas p 3780 N93-32257

Objective improvements obtained by control of diet and physical training in Spanish Air Force fighter pilots
p 3780 N93-32258
The influence of dietary counseling and cardiac catheterization on lipid profiles in American military aviators
p 3781 N93-32259
The effects of an antijet lag diet
p 3781 N93-32263

DIFFERENCE EQUATIONS
The generic dimension of a minimal realization of an AR-system
[REPT-92-82] p 3805 N93-31492

DIFFERENTIAL CALCULUS
Stable numerical integration of dynamical systems subject to equality state-space constraints
[NLR-TP-91363-U] p 3802 N93-31128
Multiparametric quantum symplectic phase space
[DE93-604081] p 3802 N93-31162

DIFFERENTIAL EQUATIONS
Global stability of systems of two differential equations with unstationary nonlinearities, 2
[DE92-642558] p 3802 N93-31072
Dissipation and convergence in the systems of differential equations with unstationary nonlinearities
[DE92-642559] p 3802 N93-31079
Homoclinic twist bifurcations with Z2 symmetry
[W-9215] p 3807 N93-31627
Differential equations method: The calculation of N (N greater than 2)-points diagrams
[DE93-609887] p 3814 N93-32412

DIFFERENTIAL GEOMETRY
Cut locus and medial axis in global shape interrogation and representation
[PB93-189884] p 3786 N93-31199
A remark about the mean curvature
[DE93-619668] p 3809 N93-32285

DIFFRACTION
Scattering by irregular particles in anomalous diffraction and discrete dipole approximations
p 3817 N93-31154
The method of smoothing applied to composite rough surface
[AD-A265236] p 3701 N93-32062

DIFFRACTION PATTERNS
Investigation of diamond homoepitaxy by in situ Fizeau interferometry: The role of oxygen
[AD-A265544] p 3829 N93-31921

DIFFUSION
Effects of hydrogen and electron diffusion on trace species diffusion in the solar atmosphere
p 3878 N93-31413
A double-peaked solar flare: Conclusions on particle transport
p 3879 N93-31415
Localization and transport in random media
[AD-A264640] p 3726 N93-32014

DIFFUSION COEFFICIENT
Tidally averaged models for dispersion in shallow water
[REPT-92-66] p 3769 N93-31497
Diffusion coefficients in molten slags
[NPL-DMM(A)-82] p 3703 N93-31603

DIGITAL COMPUTERS
Implementation of interconnect simulation tools in spice
[NASA-CR-193619] p 3792 N93-32239
Performance measures of parallel digital signal processor systems
[AD-A265804] p 3718 N93-32313

DIGITAL DATA
The use of digital road data by a navigation system
p 3678 N93-31269
The standards process: Technical committee X3B5 digital magnetic tape
p 3840 N93-31967

DIGITAL ELECTRONICS
High temperature superconducting films and multilayers for electronics
[AD-A264410] p 3828 N93-31190
Pulse-modulated control of switching valves for an electro-hydraulic servo actuator
[DLR-FB-92-18] p 3719 N93-31462

DIGITAL NAVIGATION
GDF: A digitizing format for geographical data
p 3744 N93-31260

DIGITAL SIMULATION
A catalog of landscape features. A modeling instrument for the ATKIS information system
p 3745 N93-31264

DIGITAL SYSTEMS
Development of jitter measurement procedures for digital fiber optic modules
[AD-A265550] p 3824 N93-31915
The redwood project: An overview
p 3841 N93-31979
Petite amateur naval satellite spacecraft digital control system: A hardware design
[AD-A265234] p 3690 N93-32061
Performance measures of parallel digital signal processor systems
[AD-A265804] p 3718 N93-32313

DILUENTS
Phenylethynyl endcapping reagents and reactive diluents
[NASA-CASE-LAR-14796-1] p 3702 N93-31459

DIMENSIONAL MEASUREMENT
Measurement uncertainty considerations for coordinate measuring machines
[PB93-189819] p 3714 N93-31196
Progress in speckle-shift strain measurement
p 3693 N93-31558

DIPOLE ANTENNAS
Radiation from a dipole antenna into an inhomogeneous compressible and nonlinear space-plasma
[ESA-TT-1261] p 3716 N93-31341

DIRAC EQUATION
On the Dirac equation in three dimensions
[DE93-609915] p 3813 N93-31181
Relativistic band gaps in one-dimensional disordered systems
[DE93-609841] p 3829 N93-31814
Free Maxwell equations, Dirac equation, and non-dispersive De Broglie wave packets
[DE93-609848] p 3832 N93-31908
Scalar symmetry of the massless Dirac equation
[DE93-609921] p 3832 N93-31914

DIRECTION FINDING
The use of digital road data by a navigation system
p 3678 N93-31269
Experimental evaluation of an arrival time difference lightning positioning system
[KNMI-WR-92-01] p 3767 N93-31600

DIRECTORIES
States and small business: A directory of programs and activities, 1993 edition
[PB93-186427] p 3834 N93-31433
Standardization Directory: FSC class and area assignments
[AD-A265686] p 3839 N93-31796

DISEASES
Survey of smoking habits in the Spanish Air Force
p 3781 N93-32262

DISLOCATIONS (MATERIALS)
Electron-microscopic investigations of irradiated and naturally aged aluminum alloy
[DE93-606752] p 3706 N93-31660

DISORDERS
Prevention of cumulative trauma disorders
[PB93-188332] p 3773 N93-31138

DISPERSING
Numerical modelling of mesoscale atmospheric dispersion, volumes 1 and 2
p 3765 N93-32217
Integration of measurements with atmospheric dispersion models: Source term estimation for dispersal of (239)Pu due to non-nuclear detonation of high explosive
[DE93-012550] p 3766 N93-32295

DISPERSIONS
Atmospheric dispersion of air pollutants in Umea (Sweden)
[FOA-C-40300-4.5] p 3756 N93-32424

DISPLAY DEVICES
Assessment of a human computer interface prototyping environment
[NASA-CR-192612] p 3784 N93-31849
Graphics simulation and training aids for advanced teleoperation
p 3793 N93-32119
A plotting system for three-dimensional oblique coordinates (triangular mesh) of CITATION
[DE92-526848] p 3792 N93-32185

DISSIPATION
Information-theoretic outlook of the quantum dissipation problem
[DE93-608162] p 3831 N93-31287
A rapid-distortion-theory turbulence model for developed unsteady wall-bounded flow
[NASA-TM-106249] p 3727 N93-32199

DISSOCIATION
Infrared multiple photon dissociation spectra of gaseous ions
[AD-A264378] p 3821 N93-32032

DISTORTION
A rapid-distortion-theory turbulence model for developed unsteady wall-bounded flow
[NASA-TM-106249] p 3727 N93-32199

DISTRIBUTED PARAMETER SYSTEMS
Generalized steady-state, applied to 2-D, 3-D massively parallel computing
[REPT-92-71] p 3795 N93-31504
Sensitivity analysis of coupled bending and torsional vibrations in flexible robot arms
[MEMO-1088] p 3735 N93-31526
Optimal fixed-finite-dimensional compensator for Burgers' equation with unbounded input/output operators
[NASA-CR-191454] p 3808 N93-31857

DISTRIBUTED PROCESSING
Modeling industrial distributed control systems with Petri nets
[REPT-92-079] p 3714 N93-31465
Processor-management in distributed systems with a compute-intensive workload
[REPT-92-52] p 3787 N93-31486
Distributed data systems in space physics
p 3859 N93-31715
Automatic Target Recognition (ATR) using Distributed Associative Memories (DAMS)
[AD-A265613] p 3800 N93-32169
High performance FORTRAN without templates: An alternative model for distribution and alignment
[NASA-CR-191451] p 3792 N93-32323
Towards distributed control systems for experiments under micro gravity
[NLR-TP-92027-U] p 3714 N93-32387

DISTRIBUTION FUNCTIONS
Intuitive approach to modified gyrokinetic equation and numerical confirmation
[DE93-604671] p 3812 N93-31083
Are there missing convective currents?
[DE93-604672] p 3825 N93-31084
Distribution function of excitations in systems with fractional statistics
[DE93-608195] p 3810 N93-31307

DIURNAL VARIATIONS
An investigation of methods for improving models of ionospheric plasma-density irregularities and radio-frequency scintillation
[AD-A264156] p 3756 N93-31062
Tides of Massachusetts and Cape Cod Bays
[AD-A264790] p 3770 N93-31983

DOCUMENTATION
The computer integrated documentation project: A merge of hypermedia and AI techniques
p 3801 N93-32148
Knowledge based document retrieval in office environments: The Kabiria system
[REPT-92-032] p 3843 N93-32389

DOCUMENTS
The management of change: Implications for the information professional
p 3838 N93-31222
Standardization Directory: FSC class and area assignments
[AD-A265686] p 3839 N93-31796

DOMAINS
Scheduling with partial orders and a causal model
p 3835 N93-32130

DOMES (GEOLOGY)
Reconnaissance and deep-drill site selection on Taylor Dome, Antarctica
p 3759 N93-31883

DOPED CRYSTALS
Temperature dependence of the femtosecond optical response in doped high temperature superconductors
[DE93-009514] p 3829 N93-31988
Investigation of trap emission kinetics MOS capacitors using a pump-probe charge integrating technique
[AD-A265198] p 3721 N93-31994
Photoconductivity and photovoltage generation in novel photocrosslinkable nonlinear optical polymers
[AD-A265780] p 3750 N93-32417

DOPPLER EFFECT
Simulated O VI Doppler dimming measurements of coronal outflow velocities
p 3871 N93-31367

DOPPLER RADAR
Theory and application of a Radio-Acoustic Sounding System (RASS)
[PB93-191252] p 3769 N93-31815
Technique for measuring the spin rate of kinetic energy projectiles
[AD-A264114] p 3717 N93-32031
Wind profiling in a cloudy convective atmospheric boundary layer over land
[AD-A265422] p 3768 N93-32051
Airborne derivation of microburst alerts from ground-based Terminal Doppler Weather Radar information: A flight evaluation
[NASA-TM-108990] p 3680 N93-32223

DRAG
The role of the margins in ice stream dynamics
p 3761 N93-31896

DRAG REDUCTION
Selected experiments in laminar flow: An annotated bibliography
[NASA-TM-103989] p 3673 N93-32226

DROP SIZE
Spray characteristics of two types of fuel injectors
[PB93-180859] p 3736 N93-32069

DROPS (LIQUIDS)
Transient cooling of a hot surface by droplets evaporation
[PB93-189421] p 3722 N93-31114
DUALITY THEOREM
Duality and sensitivity in quadratic optimization over a sphere
[REPT-92-65] p 3804 N93-31470
On a class of geometric vector optimization problems
[REPT-92-51] p 3804 N93-31485
DUCT GEOMETRY
Modal synthesis technique used in shallow doublewall
[FFA-TN-1992-29] p 3722 N93-31053
DUCTED FLOW
Practical flow duct acoustic modelling
[ISVR-TR-213] p 3726 N93-31838
DUST
Chemical reactivity of the Martian soil
p 3867 N93-31963
DWARF STARS
Spectral classification with the International Ultraviolet Explorer: An atlas of B-type spectra
[NASA-RP-1312] p 3861 N93-31737
DYE LASERS
Study on laser atomic spectroscopy
[DE93-606193] p 3703 N93-31824
DYNAMIC CHARACTERISTICS
Observations of the quiet Sun from the soft x ray telescope on Yohkoh p 3874 N93-31388
Dynamic formation and magnetic support of loop or arcade prominences p 3875 N93-31391
The dynamics and stability of weak double layers
[TRITA-ALP-92-02] p 3825 N93-31626
A concept of deployable tethered interferometer
p 3691 N93-31787
Interactions between magnetically levitated vehicles and elevated guideway structures
[PB93-148542] p 3736 N93-32192
DYNAMIC CONTROL
Design and application of Active Magnetic Bearings (AMB) for vibration control p 3738 N93-32279
DYNAMIC LOADS
Development of nose structure of a reconnaissance container for a supersonic jet aircraft
[MBB-LME-242-S-PUB-0451] p 3679 N93-31046
Localization of aeroelastic modes in mistuned high-energy turbines p 3697 N93-31586
DYNAMIC MODELS
Experiments in the control of wing rock at high angle of attack using tangential leading edge blowing
p 3683 N93-31068
The development of a ring model for the study of tire in-plane dynamics
[MEMT-20] p 3734 N93-31508
Basic structural dynamics p 3741 N93-32271
Modified dynamics modelling for maneuvering flexible space manipulators
[NLR-TP-91280-U] p 3737 N93-32333
Robust stability of second-order systems
[NASA-CR-193624] p 3809 N93-32373
DYNAMIC RESPONSE
Determination of design and operation parameters for upper atmospheric research instrumentation to yield optimum resolution with deconvolution. Appendix 7 --- Transform Domain Skiprope Observer for tethered satellites
[NASA-CR-192836] p 3756 N93-31041
On the feasibility of a transient dynamic design analysis
[AD-A264882] p 3733 N93-31101
A mechanics model for the compressive response of fiber reinforced composites
[AD-A265556] p 3701 N93-32067
Proceedings of the First Geological Materials Constitutive Modeling Workshop
[DE93-009161] p 3765 N93-32176
One lateral mode isotropic rotor response to nonsynchronous excitation p 3738 N93-32276
Dynamic response of a transducer mounted at one end of an acoustical cavity
[DE93-012837] p 3816 N93-32301
DYNAMIC STABILITY
Chaotic dynamics of high density photon and exciton system
[DE93-608522] p 3819 N93-31666
Vibration analysis in turbomachines
p 3683 N93-32274
DYNAMIC STRUCTURAL ANALYSIS
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-10064] p 3692 N93-31552
Structural dynamics: Probabilistic structural analysis methods. Program overview p 3694 N93-31562
Rocketdyne PSAM: In-house enhancement/application p 3694 N93-31566
Expert system development for probabilistic load simulation p 3695 N93-31570
A mechanics model for the compressive response of fiber reinforced composites
[AD-A265556] p 3701 N93-32067
Vibration and Rotor Dynamics
[VKI-LS-1992-06] p 3741 N93-32270
Basic structural dynamics p 3741 N93-32271
Structural dynamic characteristics of individual blades
p 3683 N93-32272
Structural dynamic charactertistics of bladed assemblies p 3683 N93-32273
Vibration analysis in turbomachines
p 3683 N93-32274
Excitation by flows in seals and clearances. Part 1: Introduction: Fluid-structure-interactions in rotordynamics. Part 2: Identification of rotordynamic coefficients of annular seals p 3738 N93-32275
Vibrational diagnostics of rotating machinery malfunctions p 3738 N93-32278
Modified dynamics modelling for maneuvering flexible space manipulators
[NLR-TP-91280-U] p 3737 N93-32333
DYNAMIC TESTS
On the feasibility of a transient dynamic design analysis
[AD-A264882] p 3733 N93-31101
DYNAMICAL SYSTEMS
Stable numerical integration of dynamical systems subject to equality state-space constraints
[NLR-TP-91363-U] p 3802 N93-31128
Terminology and concepts of control and Fuzzy Logic
p 3688 N93-31443
Meeting some neighbours: A dynamic modal logic meets theories of change and knowledge representation
[LP-92-10] p 3806 N93-31531
Investigation of transitions from order to chaos in dynamical systems
[DE93-014437] p 3833 N93-32290
DYNAMICS EXPLORER SATELLITES
Distinct ion population in the polar cusp: Possible signature of transient reconnection
p 3766 N93-31680
DYNAMOMETERS
Prevention of cumulative trauma disorders
[PB93-188332] p 3773 N93-31138

E

EARLY STARS
Frequency of the chemical elements in B-stars of the local field and dispersion of interstellar medium
[ETN-93-94205] p 3852 N93-31091
EARTH ATMOSPHERE
Climatic effects of harmful emissions from high altitude air traffic p 3752 N93-31926
EARTH ENVIRONMENT
List of acronyms in environmental sciences
[KNMI-PUBL-180-ED-1] p 3838 N93-31596
EARTH IONOSPHERE
An investigation of methods for improving models of ionospheric plasma-density irregularities and radio-frequency scintillation
[AD-A264156] p 3756 N93-31062
The interaction of a moving spacecraft with the ionosphere: Current collection and wake structure
p 3688 N93-31157
One-dimensional numerical simulations of the low-frequency electric fields in the CRIT1 and CRIT2 rocket experiments
[TRITA-ALP-1992-01] p 3758 N93-31625
High-latitude electric field studies using DMSP data
[AD-A265032] p 3763 N93-31996
Studies of global ionospheric electrodynamics
[AD-A265033] p 3764 N93-31997
EARTH MAGNETOSPHERE
A new method for measuring the speed of the bow shock p 3854 N93-31687
On Short Large Amplitude Magnetic Structures in the vicinity of the quasi-parallel region of the Earth's bow shock p 3854 N93-31688
Energetics of ULF/ELF plasma waves in the solar wind and outer Earth's magnetosphere p 3826 N93-31689
A study of the magnetic field annihilation process in the magnetosphere and some geotechnical applications
[DE93-013172] p 3765 N93-32164
EARTH OBSERVING SYSTEM (EOS)
Accessing Earth science data from the EOS data and information system p 3840 N93-31968
EARTH ORBITAL ENVIRONMENTS
Solar wind penetration to geostationary altitude during the March 1991 magnetic storm p 3857 N93-31706
A parametric analysis of endoatmospheric Low-Earth-Orbit maintenance
[AD-A265868] p 3685 N93-32319
Evaluation of chemical conversion material (protective coating) exposed to space environmental conditions
[NASA-TM-108416] p 3730 N93-32366
EARTH ORBITS
Orbit Analysis Tools Software user's manual, version 1
[AD-A265012] p 3686 N93-32081
EARTH ORIENTATION
Radiointerferometric observations for estimation of pole motion by using long north-south reference axes
[SER-C-368] p 3746 N93-31339
EARTH RESOURCES
Availability of platinum and platinum-group metals
[PB93-189496] p 3743 N93-31115
Helium resources of the United States, 1991
[PB93-189652] p 3743 N93-31116
EARTH ROTATION
Radiointerferometric observations for estimation of pole motion by using long north-south reference axes
[SER-C-368] p 3746 N93-31339
EARTH SCIENCES
List of acronyms in environmental sciences
[KNMI-PUBL-180-ED-1] p 3838 N93-31596
Accessing Earth science data from the EOS data and information system p 3840 N93-31968
Proceedings of the First Geological Materials Constitutive Modeling Workshop
[DE93-009161] p 3765 N93-32176
EARTH SURFACE
Land subsidence and problems affecting land use at Edwards Air Force Base and vicinity, California, 1990
[PB93-182236] p 3765 N93-32191
EARTHQUAKES
A neural network approach to seismic phase identification
[DE93-013601] p 3800 N93-32305
ECOLOGY
The ecological balance of Swissair: An example of waste management p 3753 N93-31930
ECONOMIC ANALYSIS
Preliminary study on costs needed for solution of the global environmental problem
[DE93-768474] p 3754 N93-32039
Survey on global environmental effects of petroleum substitution energy utilization
[DE93-768475] p 3754 N93-32040
ECONOMIC DEVELOPMENT
States and small business: A directory of programs and activities, 1993 edition
[PB93-186427] p 3834 N93-31433
ECONOMIC FACTORS
Engine technology challenges for a 21st Century High-Speed Civil Transport
[NASA-TM-106216] p 3681 N93-31671
ECONOMIC IMPACT
Metrication: An economic wake-up call for US industry
[PB93-188969] p 3714 N93-31109
ECONOMICS
The Impact of Changing International Relations on the Scientific and Technical Community
[AGARD-CP-523] p 3836 N93-31215
The effect of changes in markets and trade barriers on the exchange of scientific and technical information
p 3836 N93-31216
ECOSYSTEMS
Variability of temperature and salinity in the Middle Atlantic Bight and Gulf of Maine
[PB93-174019] p 3769 N93-31591
EDDY CURRENTS
An integrated eddy current detection and imaging system on a silicon chip p 3693 N93-31560
EDGE DETECTION
A proposal on the quality of the binary thresholds of a contour detection
[REPT-91-075] p 3806 N93-31544
EDUCATION
Foreign participation in US Academic science and engineering: 1991
[PB93-186583] p 3833 N93-31323
Efficient fault diagnosis of helicopter gearboxes
[NASA-TM-106253] p 3735 N93-31846
A preliminary empirical evaluation of virtual reality as an instructional medium for visual-spatial tasks
p 3784 N93-32151
The 1992 Langley Aerospace Research Summer Scholars (LARSS) program
[NASA-CR-193371] p 3833 N93-32229
EIGENVALUES
Modal synthesis technique used in shallow doublewall
[FFA-TN-1992-29] p 3722 N93-31053
Calculations of wavefunctions and energies of electron system in Coulomb potential by variational method without a basis set
[DE93-608161] p 3819 N93-31286
A normally elliptic Hamiltonian bifurcation
[W-9214] p 3807 N93-31623

Hamiltonian moments and the Lanczos method in the Heisenberg model
[DE93-609845] p 3813 N93-31905
Plaquette expansion in lattice Hamiltonian models
[DE93-609846] p 3813 N93-31906
On the real symmetric inverse eigenvalue problem
[DE93-619667] p 3809 N93-32284

EIGENVECTORS
Calculations of wavefunctions and energies of electron system in Coulomb potential by variational method without a basis set
[DE93-608161] p 3819 N93-31286
On the real symmetric inverse eigenvalue problem
[DE93-619667] p 3809 N93-32284

EINSTEIN EQUATIONS
Ashtekar variables, self-dual metrics, and w(infinity)
[DE92-642588] p 3802 N93-31074
A universal mass in (2+1)-dimensions
[DE93-609888] p 3832 N93-31911

EJECTA
Study of the Solar-Terrestrial System
[ESA-SP-346] p 3852 N93-31674
Origin of the solar wind and coronal mass ejections p 3856 N93-31702
Detecting and tracking changes in solar wind conditions using interplanetary scintillation p 3857 N93-31703
Possible manifestation of the critical ionization velocity phenomenon in the solar corona p 3861 N93-31726

ELASTIC DAMPING
Damping mechanisms in chemically vapor deposited SiC fibers
[NASA-TM-109236] p 3701 N93-32219

ELASTIC PROPERTIES
Measurement of the out-of-plane shear response of thick section composite materials using the v-notched beam specimen
[AD-A264898] p 3699 N93-31065
On the feasibility of a transient dynamic design analysis
[AD-A264882] p 3733 N93-31101
Biharmonic pattern selection
[DE93-608186] p 3803 N93-31303
An operator method to study some resonance boundary value problems in elasticity theory
[REPT-92-84] p 3740 N93-31490
Secondary orientation effects in a single crystal superalloy under mechanical and thermal loads p 3696 N93-31578
Pressure induced topological phase transitions in membranes
[AD-A265212] p 3829 N93-32002

ELASTIC SCATTERING
Nonlinear Pomeron and Odderon in elastic re-scatterings
[DE93-608326] p 3818 N93-31241
Supercritical pomeron and spin effects in meson-nucleon scattering at high energy
[DE93-608327] p 3818 N93-31242
Theoretical investigation of electron-positive ion/atom interactions
[DE93-012933] p 3822 N93-32162
Nuclear structure effects in elastic and inelastic scattering of light ions
[DE93-616909] p 3822 N93-32407

ELASTOPLASTICITY
Deformation analysis of welded joints
[ETN-93-94199] p 3739 N93-31057

ELECTRIC AUTOMOBILES
Feasibility study on introduction of petroleum substituting energy for transportation
[DE93-768472] p 3750 N93-32058

ELECTRIC CHARGE
The dynamics and stability of weak double layers
[TRITA-ALP-92-02] p 3825 N93-31626

ELECTRIC CONDUCTORS
Sealed acoustical element using conductive epoxy
[AD-D015736] p 3730 N93-32208

ELECTRIC CONNECTORS
Service equipment for use in hostile environments
[NASA-CASE-LEW-14906-2] p 3734 N93-31314

ELECTRIC CONTACTS
Method and apparatus for characterizing the quality for electrically thin semiconductor films
[AD-D015734] p 3830 N93-32206

ELECTRIC CONTROL
Liquid-crystal heat valve controlled with multiple electrode pairs
[AD-D015739] p 3830 N93-32211

ELECTRIC CORONA
Coronal shock waves p 3853 N93-31681
Coronal mass ejecta and flares: A statistical study p 3859 N93-31716

ELECTRIC CURRENT
Are there missing convective currents?
[DE93-604672] p 3825 N93-31084
A magnetostatic coronal model with horizontal electric currents: Modeling the coronal streamer belt p 3871 N93-31366
Magnetospheric convection and current system in the dayside polar cap p 3856 N93-31700
Method and apparatus for characterizing the quality for electrically thin semiconductor films
[AD-D015734] p 3830 N93-32206

ELECTRIC DISCHARGES
Study on laser atomic spectroscopy
[DE93-606193] p 3703 N93-31824

ELECTRIC ENERGY STORAGE
Eleventh Annual Conference on Energy Conservation and Storage Technologies
[DE93-768429] p 3748 N93-32038

ELECTRIC FIELDS
Multi-quantum well lateral-field-effect electro-refraction modulator
[AD-A264411] p 3729 N93-31191
An electrostatic mirror for neutral polar molecules
[DE93-609405] p 3818 N93-31228
One-dimensional numerical simulations of the low-frequency electric fields in the CRIT1 and CRIT2 rocket experiments
[TRITA-ALP-1992-01] p 3758 N93-31625
Auroral Cluster: Science objectives and measurement strategies p 3858 N93-31710
Viking observations of electric fields p 3858 N93-31712
Plasma waves interferometry on Cluster p 3827 N93-31714
On the Bernstein modes generation in solar post-flare loops p 3859 N93-31718
Investigation of fine-scale aurora with the Freja electric field instrument p 3860 N93-31719
Wavefront reconstruction from three dimensional intensity measurements
[DE93-609881] p 3832 N93-31909
High-latitude electric field studies using DMSP data
[AD-A265032] p 3763 N93-31996
Optically guided laser wakefield acceleration
[AD-A265441] p 3732 N93-32019
Effects of surface defects on the local electric field in inhomogeneous media
[DE93-011035] p 3830 N93-32182

ELECTRIC GENERATORS
New alternative for electricity production. Part 3: Electricity production from biomass and natural gas by a solid oxide fuel cell
[VTT-TIED-1397] p 3720 N93-31862

ELECTRIC NETWORKS
Implementation of interconnect simulation tools in spice
[NASA-CR-193619] p 3792 N93-32239

ELECTRIC POTENTIAL
Test measurements for quick analog digital converters for an x ray CCD camera
[ETN-93-94204] p 3728 N93-31119
Two-stage gas measurement system
[NASA-CASE-LAR-14791-1] p 3729 N93-31297
Liquid-crystal heat valve controlled with multiple electrode pairs
[AD-D015739] p 3830 N93-32211

ELECTRIC POWER PLANTS
New alternative for electricity production. Part 3: Electricity production from biomass and natural gas by a solid oxide fuel cell
[VTT-TIED-1397] p 3720 N93-31862

ELECTRIC POWER SUPPLIES
Thulium heat sources for space power application
[DE93-002249] p 3691 N93-31168

ELECTRIC POWER TRANSMISSION
Transient analysis for ground fault distance estimation in electrical distribution networks
[VTT-PUBS-115] p 3720 N93-31536

ELECTRIC PROPULSION
The PIT MkV pulsed inductive thruster
[NASA-CR-191155] p 3698 N93-32353

ELECTRIC RELAYS
Noise attenuating circuit for mechanical relay including optical isolation
[AD-D015700] p 3720 N93-31842

ELECTRICAL FAULTS
Transient analysis for ground fault distance estimation in electrical distribution networks
[VTT-PUBS-115] p 3720 N93-31536

ELECTRICAL IMPEDANCE
Benet improvements made on Los Alamos electromagnetic field code
[AD-A265474] p 3718 N93-32065

ELECTRICAL MEASUREMENT
Electrical conductivities of molten slags
[NPL-DMM(A)-79] p 3705 N93-31324
Characterization of small noble metal electrodes by voltammetry and energy dispersive x ray analysis
[AD-A265208] p 3721 N93-32001
Shaly sand formation evaluation in tight gas sands using electrochemical potential measurements
[PB93-163186] p 3764 N93-32087

ELECTRICAL PROPERTIES
Affecting factors to the electrical properties of RuO2 thick-film resistors
[DE93-768332] p 3721 N93-32055
Benet improvements made on Los Alamos electromagnetic field code
[AD-A265474] p 3718 N93-32065
Physical characterization and study of the electrical magnetic and thermal properties of the ceramic high Tc superconductor Y1Ba2Cu3O(7-x)
[DE92-640219] p 3711 N93-32187

ELECTRICAL RESISTIVITY
High temperature superconductivity: Concept, preparation and testing of high T(sub c) superconductor compounds and applications
[DE93-608696] p 3827 N93-31077
High temperature superconducting films and multilayers for electronics
[AD-A264410] p 3828 N93-31190
Method for producing hybrid graphite composite
[NASA-CASE-LEW-15241-2] p 3700 N93-31296
Electrical conductivities of molten slags
[NPL-DMM(A)-79] p 3705 N93-31324
Functionalized polymeric materials for electronics and optics
[AD-A265788] p 3710 N93-31802
Shaly sand formation evaluation in tight gas sands using electrochemical potential measurements
[PB93-163186] p 3764 N93-32087
Two and three dimensional magnetotelluric inversion
[DE93-013233] p 3765 N93-32165
Non-destructive, ultra-low resistance, thermally stable contacts for use on shallow junction InP solar cells
[NASA-TM-106228] p 3750 N93-32201

ELECTRO-OPTICS
Multi-quantum well lateral-field-effect electro-refraction modulator
[AD-A264411] p 3729 N93-31191
Efficient optical logic, interconnections and processing using quantum confined structures
[AD-A265734] p 3823 N93-31799
Functionalized polymeric materials for electronics and optics
[AD-A265788] p 3710 N93-31802
Optoelectronic Materials Center: A collaborative program including University of New Mexico, Stanford University and California Institute of Technology
[AD-A265575] p 3732 N93-32052
Development of a large field-of-view KD potassium di-deuterium phosphate modulator: Center Director's Discretionary Fund
[NASA-TM-108410] p 3824 N93-32378

ELECTROCHEMICAL CORROSION
Investigation of the electrochemical polarisation behaviour of SiC/6061 Al metal matrix composites
[NPL-DMM(A)-31] p 3700 N93-31736

ELECTROCHEMISTRY
Kinetics of mediated electron transfer between viologen groups in a self-assembled monolayer and metal complexes in solution
[AD-A265729] p 3820 N93-31797
Detection of radiation-induced changes in electrochemical properties of austenitic stainless steels using miniaturized specimens and the single-loop electrochemical potentiokinetic reactivation method
[DE93-012865] p 3707 N93-32302

ELECTRODE MATERIALS
Characterization of small noble metal electrodes by voltammetry and energy dispersive x ray analysis
[AD-A265208] p 3721 N93-32001

ELECTRODES
Potential distributions at gas evolving electrodes
[DLR-FB-92-20] p 3702 N93-31319
Characterization of small noble metal electrodes by voltammetry and energy dispersive x ray analysis
[AD-A265208] p 3721 N93-32001
Advanced alternate planar geometry solid oxide fuel cells
[DE93-000248] p 3721 N93-32174
Sealed acoustical element using conductive epoxy
[AD-D015736] p 3730 N93-32208
Liquid-crystal heat valve controlled with multiple electrode pairs
[AD-D015739] p 3830 N93-32211

ELECTRODYNAMICS
Characteristics and properties of the continuity equations in a semiconductor
[REPT-92-080] p 3720 N93-31609
One-dimensional numerical simulations of the low-frequency electric fields in the CRIT1 and CRIT2 rocket experiments
[TRITA-ALP-1992-01] p 3758 N93-31625

A generalization of Dirac non-linear electrodynamics, and spinning charged particles
| DE93-609847 | p 3821 N93-31907
Studies of global ionospheric electrodynamics
| AD-A265033 | p 3764 N93-31997
ELECTROLYSIS
Potential distributions at gas evolving electrodes
| DLR-FB-92-20 | p 3702 N93-31319
ELECTROLYTIC CELLS
Advanced alternate planar geometry solid oxide fuel cells
| DE93-000248 | p 3721 N93-32174
ELECTROMAGNETIC ABSORPTION
Efficient optical logic, interconnections and processing using quantum confined structures
| AD-A265734 | p 3823 N93-31799
ELECTROMAGNETIC FIELDS
Radiation reaction for the classical relativistic spinning particle in scalar, tensor and linearized gravitational fields
| DE93-608191 | p 3757 N93-31304
Mechanisms of microwave induced damage in biologic materials
| AD-A264415 | p 3772 N93-32035
Benet improvements made on Los Alamos electromagnetic field code
| AD-A265474 | p 3718 N93-32065
ELECTROMAGNETIC INTERACTIONS
Radiative electroweak breaking and sparticle spectroscopy with tan(beta) is approximately equal to (m(sub t)) divided by (m(sub b))
| DE93-608399 | p 3832 N93-31663
ELECTROMAGNETIC PROPERTIES
Low aperture magnetic elements measurements
| DE93-605897 | p 3814 N93-31088
Electromagnetic response of a superconducting wire of finite length in a perpendicular applied AC magnetic field
| MEMO-1087 | p 3716 N93-31516
Benet improvements made on Los Alamos electromagnetic field code
| AD-A265474 | p 3718 N93-32065
ELECTROMAGNETIC RADIATION
Nonlinear response function for two-phonon polaritons
| DE93-608692 | p 3817 N93-31099
Operation of the helicopter antenna radiation prediction code
| NASA-CR-193259 | p 3715 N93-31110
ELECTROMAGNETIC SCATTERING
The method of smoothing applied to composite rough surface
| AD-A265236 | p 3701 N93-32062
An acoustic scattering code
| AD-A265863 | p 3816 N93-32316
ELECTROMAGNETIC SURFACE WAVES
Nonlinear radiation of waves at combination frequencies due to radiation-surface wave interaction in plasmas
| DE93-608570 | p 3825 N93-31667
ULF/ELF electromagnetic waves associated with the quasiperpendicular Earth's bow shock crossings
p 3827 N93-31690
ELECTROMAGNETIC WAVE TRANSMISSION
Polametric passive remote sensing of ocean surface
| AD-A265874 | p 3746 N93-32173
ELECTROMAGNETISM
A generalization of Dirac non-linear electrodynamics, and spinning charged particles
| DE93-609847 | p 3821 N93-31907
ELECTROMAGNETS
A decoupled control approach for magnetic suspension systems using electromagnets mounted in a planar array
| NASA-TM-109011 | p 3715 N93-32227
ELECTROMECHANICAL DEVICES
Noise attenuating circuit for mechanical relay including optical isolation
| AD-D015700 | p 3720 N93-31842
Electropneumatic actuator, phase 1
| PB93-174951 | p 3720 N93-31876
ELECTROMOTIVE FORCES
Temperature-electromotive force reference functions and tables for the letter-designated thermocouple types based on the ITS-90
| PB93-190338 | p 3729 N93-31214
ELECTRON ACCELERATORS
Report of the working group on far field accelerators
| AD-A265443 | p 3732 N93-32021
ELECTRON BEAMS
Low voltage electron beam lithography
| AD-A263360 | p 3719 N93-31080
Chemical effects of ionizing radiations and electron beam in polymers: Industrial uses
| DE93-609337 | p 3708 N93-31179
Pulse-beam heating in flare loops
p 3875 N93-31392
Optically guided laser wakefield acceleration
| AD-A265441 | p 3732 N93-32019
Report of the working group on far field accelerators
| AD-A265443 | p 3732 N93-32021
Utilization of high energy electron beam in the treatment of drinking and waste water
| DE92-642335 | p 3783 N93-32406
ELECTRON CAPTURE
Electron trapping optical data storage system and applications p 3730 N93-31975
Investigation of trap emission kinetics MOS capacitors using a pump-probe charge integrating technique
| AD-A265198 | p 3721 N93-31994
ELECTRON DENSITY (CONCENTRATION)
General properties of the polarization of the Fe 14 5303 A coronal emission line p 3877 N93-31404
Exploring the magnetospheric boundary layer
p 3855 N93-31694
ELECTRON DENSITY PROFILES
The July 11, 1991 solar corona observed in polarized white light: Preliminary results p 3879 N93-31417
Plasma waves interferometry on Cluster
p 3827 N93-31714
ELECTRON DIFFRACTION
Si atomic layer epitaxy based on Si2H6 and remote He plasma bombardment
| DE93-011674 | p 3830 N93-32183
ELECTRON DIFFUSION
Effects of hydrogen and electron diffusion on trace species diffusion in the solar atmosphere
p 3878 N93-31413
ELECTRON DISTRIBUTION
Radio observations of coronal streamers
p 3870 N93-31359
ELECTRON EMISSION
Low voltage electron beam lithography
| AD-A263360 | p 3719 N93-31080
Investigation of trap emission kinetics MOS capacitors using a pump-probe charge integrating technique
| AD-A265198 | p 3721 N93-31994
ELECTRON ENERGY
Low voltage electron beam lithography
| AD-A263360 | p 3719 N93-31080
Measuring electron temperature in the extended corona p 3880 N93-31422
Exploring the magnetospheric boundary layer
p 3855 N93-31694
ELECTRON GAS
New edge magnetoplasmon for a two-dimensional electron gas in a ring geometry
| DE93-608737 | p 3825 N93-31164
ELECTRON SCATTERING
The ZEUS uranium calorimeter: Main characteristics and first operating experience
| NIKHEF-H/92-15 | p 3728 N93-31117
Scattering of electrons at heterostructure interfaces
| ETN-93-94044 | p 3828 N93-31523
Excitation of atomic hydrogen
| DE93-604639 | p 3820 N93-31822
Theoretical investigation of electron-positive ion/atom interactions
| DE93-012933 | p 3822 N93-32162
ELECTRON STATES
Metastability in molecules
| AD-A264344 | p 3817 N93-31063
Electronic Landau levels in quantum wells with periodically structured interfaces
| DE93-608514 | p 3828 N93-31664
ELECTRON TRANSFER
Monte-Carlo simulations of secondary electron emission from CsI, induced by 1-10 keV x rays and electrons
| DE93-604906 | p 3818 N93-31239
Kinetics of mediated electron transfer between viologen groups in a self-assembled monolayer and metal complexes in solution
| AD-A265729 | p 3820 N93-31797
Quantum transport
| AD-A264935 | p 3832 N93-32072
ELECTRONIC BULLETIN BOARDS
Online guided tour of the Cleanup Information Bulletin Board System. (CLU-IN: Cleanup Information Bulletin Board)
| PB93-193704 | p 3752 N93-31818
ELECTRONIC CONTROL
Pulse-modulated control of switching valves for an electro-hydraulic servo actuator
| DLR-FB-92-18 | p 3719 N93-31462
ELECTRONIC EQUIPMENT
Service equipment for use in hostile environments
| NASA-CASE-LEW-14906-2 | p 3734 N93-31314
Statistics of mass production
| AD-A264365 | p 3715 N93-31867
ELECTRONIC MAIL
Online guided tour of the Cleanup Information Bulletin Board System. (CLU-IN: Cleanup Information Bulletin Board)
| PB93-193704 | p 3752 N93-31818
ELECTRONIC WARFARE
Tracking filters for precision Electronic Support Measures (ESM) systems
| AD-A264089 | p 3719 N93-31085
Deinterleaver technology for future Electronic Support Measures (ESM) systems
| AD-A265005 | p 3721 N93-32079
ELECTRONICS
Prometheus in space: Survey report of Research Committee on Functional New Material
p 3710 N93-31728
ELECTRONS
The optical response of a double quantum well driven by two lasers: Localization and low frequency generation
| AD-A265118 | p 3819 N93-31792
Electron trapping optical data storage system and applications p 3730 N93-31975
ELECTROSTATIC PROPULSION
Inertial electrostatic confinement as a power source for electric propulsion
| NASA-TM-109228 | p 3692 N93-31310
ELECTROSTATICS
An electrostatic mirror for neutral polar molecules
| DE93-609405 | p 3818 N93-31228
Inertial electrostatic confinement as a power source for electric propulsion
| NASA-TM-109228 | p 3692 N93-31310
ELEMENTARY PARTICLES
Non-standard representations of the space-time groups and their applications to the dynamical theory of elementary particles
| DE93-608203 | p 3818 N93-31240
ELEVATION
Tracking filters for precision Electronic Support Measures (ESM) systems
| AD-A264089 | p 3719 N93-31085
Changes on the ice plain of Ice Stream B and Ross Ice Shelf p 3760 N93-31889
ELLIPSOMETRY
Si/SiO2 interface studies by immersion ellipsometry
| AD-A265151 | p 3710 N93-31991
EMBEDDED COMPUTER SYSTEMS
Assessment of a human computer interface prototyping environment
| NASA-CR-192612 | p 3784 N93-31849
EMBEDDING
Information for the user in design of intelligent systems p 3801 N93-32149
EMISSION SPECTRA
Ground-based coronagraphic observations of solar streamers p 3870 N93-31358
Quiet and active solar structures as observed at the bottom of the transition region p 3874 N93-31382
General properties of the polarization of the Fe 14 5303 A coronal emission line p 3877 N93-31404
A diagnostic method for reconnecting magnetic fields in the solar corona p 3877 N93-31406
Abundance determination in the quiet corona
p 3877 N93-31407
Four dimensional reconstruction and analysis of plume images p 3694 N93-31561
Effect of DCB extraction on Mossbauer and spectral data for a Hawaiian palagonitic soil (PN-9): Iden tification of pigmentary phases p 3864 N93-31950
An analysis of the composition of auroral emissions in the near infrared
| AD-A265493 | p 3764 N93-32009
EMISSIVITY
Sensor fusion for assured vision in space applications
p 3824 N93-32105
EMITTANCE
Sensor fusion for assured vision in space applications
p 3824 N93-32105
EMITTERS
R and D status report: RF vacuum microelectronics
| AD-A264381 | p 3721 N93-32033
Deinterleaver technology for future Electronic Support Measures (ESM) systems
| AD-A265005 | p 3721 N93-32079
EMOTIONAL FACTORS
Subjective mood and fatigue of C-141 crew during Desert Storm p 3782 N93-32264
END EFFECTORS
Contact mechanics and the dynamics of manipulation
p 3733 N93-31103
A theory of planar grasp
| OUEL-1958/92 | p 3785 N93-31126
Split rail gripper assembly and tool driver therefor
| NASA-CASE-GSC-13370-1 | p 3734 N93-31317
A comparison of force control algorithms for robots in contact with flexible environments
| NASA-CR-193251 | p 3789 N93-31638
Ground Robotic Hand Applications for the Space Program study (GRASP)
| NASA-CR-193571 | p 3737 N93-32235

ENDOCRINOLOGY
An annotated bibliography of research involving women, conducted at the US Army Research Institute of Environmental Medicine
[AD-A265497] p 3773 N93-31917
ENERGETIC PARTICLES
The Charge, Element, and Isotope Analysis System CELIAS on SOHO p 3869 N93-31352
COSTEP: Comprehensive suprathermal and energetic particle analyser for SOHO: Scientific goals and data description p 3869 N93-31353
Energetic particle analyser ERNE p 3869 N93-31354
Energetic particle observations and the abundances of elements in the solar corona p 3878 N93-31410
Influence of interplanetary shocks on approximately 10 MeV protons: A phenomenological classification p 3854 N93-31686
Energetic particles (greater than 34 KeV - 3.2 MeV) in the deep Martian magnetotail (X = 15.5 R(sub M)), modeling of the Martian bow shock and the influence of low solar wind pressure on Mars as an obstacle p 3855 N93-31691
Observation of particle bursts in the tail of planet Mars onboard the Phobos 2 spacecraft p 3856 N93-31699
ENERGY CONSERVATION
Study survey on a high-efficiency environment harmony type energy cascade utilization system
[DE93-768469] p 3748 N93-31812
Preliminary study on costs needed for solution of the global environmental problem
[DE93-768474] p 3754 N93-32039
International Energy Agency's Heat Pump Centre (IEA-HPC) Annual National Team Working Group Meeting
[DE93-009932] p 3750 N93-32281
ENERGY CONSUMPTION
Nutritional assessment of United States tactical air command pilots p 3778 N93-32242
ENERGY CONVERSION
Fusion energy for space: Feasibility demonstration. A proposal to NASA
[NASA-TM-109227] p 3825 N93-31309
Eleventh Annual Conference on Energy Conservation and Storage Technologies
[DE93-768429] p 3748 N93-32038
Japan's Sunshine Project
[DE93-768157] p 3749 N93-32041
Japan's Sunshine Project
[DE93-768166] p 3749 N93-32042
Session of alcohol and biomass energy technology
[DE93-768440] p 3749 N93-32056
ENERGY CONVERSION EFFICIENCY
Cerenkov type phase-matched second harmonic generation in polymeric channel waveguides
[AD-A265787] p 3710 N93-31801
Advanced alternate planar geometry solid oxide fuel cells
[DE93-000248] p 3721 N93-32174
ENERGY DISSIPATION
Contact mechanics and the dynamics of manipulation p 3733 N93-31103
U.S. National weather experiment STORM-FEST 1992: Wave and turbulence in frontal zones
[AD-A264294] p 3766 N93-31182
Interaction of solar wind ions with thin carbon foils: Calibration of time-of-flight spectrometers p 3880 N93-31423
ENERGY GAPS (SOLID STATE)
Relativistic band gaps in one-dimensional disordered systems
[DE93-609841] p 3829 N93-31814
ENERGY LEVELS
The constraint for the lowest Landau level and the effective field theory approach for the fractional quantum hall system
[DE93-608200] p 3831 N93-31509
Excitation rate and background measurements during LIF studies on krypton
[DE93-013500] p 3732 N93-32304
ENERGY OF FORMATION
The thermodynamic and structural contributions to the vacancy formation energies in hot rare gas solids
[DE93-604742] p 3827 N93-31086
ENERGY POLICY
Survey on global environmental effects of petroleum substitution energy utilization
[DE93-768475] p 3754 N93-32040
ENERGY REQUIREMENTS
Portable equipment developed to estimate energy expenditure by simultaneous recording of heart rate and body position p 3778 N93-32243
ENERGY SPECTRA
QUASAR: An interactive program for spectrum analysis in personal computers
[DE93-609814] p 3786 N93-31248
Energetic particle analyser ERNE p 3869 N93-31354
ENERGY TECHNOLOGY
Computer simulation of energy profiles in a plasma focus device
[DE93-608560] p 3826 N93-31673
Japan's Sunshine Project
[DE93-768309] p 3748 N93-31811
Study survey on a high-efficiency environment harmony type energy cascade utilization system
[DE93-768469] p 3748 N93-31812
Eleventh Annual Conference on Energy Conservation and Storage Technologies
[DE93-768429] p 3748 N93-32038
Survey on global environmental effects of petroleum substitution energy utilization
[DE93-768475] p 3754 N93-32040
Japan's Sunshine Project
[DE93-768157] p 3749 N93-32041
Japan's Sunshine Project
[DE93-768166] p 3749 N93-32042
Session of alcohol and biomass energy technology
[DE93-768440] p 3749 N93-32056
Feasibility study on introduction of petroleum substituting energy for transportation
[DE93-768472] p 3750 N93-32058
ENERGY TRANSFER
Mass, momentum and energy transport from the Sun to the Earth by different types of the solar wind: Prognoz 7 observations p 3857 N93-31705
ENGINE DESIGN
The Thermionic Fuel Element Verification Program: Technical progress and future plans
[DE93-003797] p 3691 N93-31185
Propulsion technology challenges for turn-of-the-century commercial aircraft
[NASA-TM-106192] p 3682 N93-32351
Analytical and experimental investigations of the oblique detonation wave engine concept
[NASA-TM-102839] p 3683 N93-32374
ENGINE INLETS
Instrumentation for in-flight acoustic measurements in an engine inlet duct of a Fokker 100 aircraft
[NLR-TP-91200-U] p 3680 N93-32332
ENGINE MONITORING INSTRUMENTS
OPAD 1991 p 3693 N93-31559
Enhancements to the Engine Data Interpretation System (EDIS)
[NASA-CR-193363] p 3800 N93-32230
ENGINE NOISE
Engine exhaust characteristics evaluation in support of aircraft acoustic testing
[NASA-TM-104263] p 3682 N93-32220
ENGINE PARTS
Probabilistic evaluation of SSME structural components p 3694 N93-31565
Probabilistic structural analysis algorithm development for computational efficiency p 3695 N93-31569
Constitutive and damage material modeling in a high pressure hydrogen environment p 3696 N93-31577
Examination of the effect of propulsion system performance variables on the life prediction for the SSME Lox Post p 3697 N93-31580
ENGINE TESTS
Comparison of straight and 15 degree vectored nozzles using a six component thrust stand
[NASA-CR-193291] p 3725 N93-31641
Fractographic and microstructural analysis of fatigue crack growth in Ti-6Al-4V fan disc forgings p 3681 N93-31742
Low cycle fatigue behaviour of titanium disc alloys p 3682 N93-31745
Conclusions and recommendations p 3682 N93-31749
Hypersonic engine component experiments in high heat flux, supersonic flow environment
[NASA-TM-106273] p 3726 N93-31860
ENGINEERING MANAGEMENT
NASA Engineering and Technology Advancement Office: A proposal to the administrator
[NASA-TM-109229] p 3685 N93-31312
ENTRAINMENT
Neurophysiological analysis of circadian rhythm entrainment
[AD-A264681] p 3774 N93-32018
ENVIRONMENT EFFECTS
The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 3, part 2
[PB93-174811] p 3748 N93-31105
Variability of temperature and salinity in the Middle Atlantic Bight and Gulf of Maine
[PB93-174019] p 3769 N93-31591
Air Traffic and Environment
[GSF-BAND-8] p 3752 N93-31925
Effects of air traffic on nature and environment in the neighborhood of airports by example of the Munich 2 Airport (Germany) p 3753 N93-31932
Survey on global environmental effects of petroleum substitution energy utilization
[DE93-768475] p 3754 N93-32040
Study on new biomass energy systems
[DE93-768470] p 3749 N93-32057
Benthic study of the continental slope off Cape Hatteras, North Carolina, volume 2
[PB93-186070] p 3771 N93-32190
Integration of measurements with atmospheric dispersion models: Source term estimation for dispersal of (239)Pu due to non-nuclear detonation of high explosive
[DE93-012550] p 3766 N93-32295
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 3: Appendices
[PB93-186088] p 3771 N93-32308
ENVIRONMENT MANAGEMENT
Indigenous views of land and the environment
[PB93-186898] p 3755 N93-32166
Vegetation mapping for environment management and monitoring
[ETN-93-93466] p 3747 N93-32342
A new view of the sea
[ETN-93-93469] p 3747 N93-32345
ENVIRONMENT POLLUTION
The ecological balance of Swissair: An example of waste management p 3753 N93-31930
Effects of air traffic on nature and environment in the neighborhood of airports by example of the Munich 2 Airport (Germany) p 3753 N93-31932
Study on new biomass energy systems
[DE93-768470] p 3749 N93-32057
Applications analysis report: Silicate Technology Corporation's solidification/stabilization technology for organic and inorganic contaminants in soils
[PB93-172948] p 3715 N93-32408
ENVIRONMENT PROTECTION
Florida's estuaries: A citizen's guide to coastal living and conservation
[PB93-189330] p 3751 N93-31113
Environment and safety research
[PB93-188860] p 3751 N93-31142
Towards a sustainable urban environment: The Rio de Janeiro study
[PB93-187557] p 3751 N93-31330
TSCA confidential business information security manual
[PB93-184844] p 3839 N93-31833
Preliminary study on costs needed for solution of the global environmental problem
[DE93-768474] p 3754 N93-32039
Making clean gasoline: The effect on jet fuels
[AD-A264302] p 3713 N93-32085
Proceedings: 1991 SO2 Control Symposium, volume 2, sessions 4 and 5A
[PB93-196103] p 3754 N93-32090
Proceedings: 1991 SO2 Control Symposium, volume 3, sessions 5B and 6
[PB93-196111] p 3755 N93-32091
Proceedings: 1991 SO2 Control Symposium, volume 4, session 7
[PB93-196129] p 3755 N93-32092
Proceedings: 1991 SO2 Control Symposium, volume 5, session 8
[PB93-196137] p 3755 N93-32093
Indigenous views of land and the environment
[PB93-186898] p 3755 N93-32166
Proceedings of the 1991 SO2 Control Symposium, volume 1
[PB93-196095] p 3755 N93-32168
Integration of measurements with atmospheric dispersion models: Source term estimation for dispersal of (239)Pu due to non-nuclear detonation of high explosive
[DE93-012550] p 3766 N93-32295
ENVIRONMENTAL CONTROL
Atmospheric control systems p 3689 N93-31456
Attention focussing and anomaly detection in real-time systems monitoring p 3730 N93-32139
Microbiological test results of the environmental control and life support systems vapors compression distillation subsystem recycle tank components following various pretreatment protocols
[NASA-CR-192570] p 3772 N93-32354
Microbiological and corrosion analysis of three urine pretreatment regimes with titanium 6A1-4V
[NASA-CR-192575] p 3783 N93-32356
ENVIRONMENTAL MONITORING
Rapid instrumental and separation methods for monitoring radionuclides in food and environmental samples
[DE93-608744] p 3820 N93-31813

Methodology to apportion ambient air measurements to investigate potential effects on air quality near waste incinerators
[PB93-191393] p 3754 N93-32088
ENVIRONMENTAL SURVEYS
The ecological balance of Swissair: An example of waste management p 3753 N93-31930
Survey on global environmental effects of petroleum substitution energy utilization
[DE93-768475] p 3754 N93-32040
ENVIRONMENTAL TESTS
Potential roles for EVA and telerobotics in a unified worksite p 3690 N93-32118
Evaluation of chemical conversion material (protective coating) exposed to space environmental conditions
[NASA-TM-108416] p 3730 N93-32366
EPIDEMIOLOGY
Cardiovascular risk factors in an Italian Air Force population: Preliminary report p 3775 N93-32252
EPITAXY
Study of improved critical currents and mechanical properties in YBaCuO superconductor with Ag or 211
[AD-A265749] p 3829 N93-31804
Progress toward atomic layer epitaxy of diamond using radical chemistry
[AD-A265409] p 3829 N93-32045
Optoelectronic Materials Center: A collaborative program including University of New Mexico, Stanford University and California Institute of Technology
[AD-A265575] p 3732 N93-32052
Si atomic layer epitaxy based on Si2H6 and remote He plasma bombardment
[DE93-011674] p 3830 N93-32183
EPOXY MATRIX COMPOSITES
Perforated carbon-epoxy plates damage modeling for quasi-static biaxial loading
[ESA-TT-1273] p 3740 N93-31428
High cycle fatigue of glass fibre reinforced epoxy materials for wind turbines
[DLR-FB-92-17] p 3700 N93-31461
EPOXY RESINS
Sealed acoustical element using conductive epoxy
[AD-D015736] p 3730 N93-32208
Epoxy self-priming topcoats
[AD-D015737] p 3711 N93-32209
EQUATIONS OF MOTION
Radiation reaction for the classical relativistic spinning particle in scalar, tensor and linearized gravitational fields
[DE93-608191] p 3757 N93-31304
Evolution and oscillations of coronal loops p 3876 N93-31395
On the dynamics of aeroelastic oscillators with one degree of freedom
[REPT-92-96] p 3815 N93-31653
A rapid-distortion-theory turbulence model for developed unsteady wall-bounded flow
[NASA-TM-106249] p 3727 N93-32199
A parametric analysis of endoatmospheric Low-Earth-Orbit maintenance
[AD-A265868] p 3685 N93-32319
Satellite motion around an oblate planet: A perturbation solution for all orbital parameters
[AD-A265779] p 3690 N93-32335
EQUATIONS OF STATE
Covariant description of the delta in nuclear matter
[KVI-951] p 3817 N93-31149
EQUILIBRIUM EQUATIONS
Thermal profiles of coronal loops: Gravitational considerations p 3873 N93-31381
Fast computation of magnetohydrostatic equilibria using Euler potentials and multigrid methods p 3877 N93-31401
A normally elliptic Hamiltonian bifurcation
[W-9214] p 3807 N93-31623
EQUIVALENT CIRCUITS
Experiments on a general thermoacoustic engine
[AD-A265864] p 3817 N93-32317
Measurements and analysis of the equivalent circuit of the GEC RF Reference Cell
[DE93-013498] p 3718 N93-32425
ERGODIC PROCESS
Most monothetic extensions are rank-1
[REPT-93-05] p 3813 N93-31546
ERROR ANALYSIS
Stable numerical integration of dynamical systems subject to equality state-space constraints
[NLR-TP-91363-U] p 3802 N93-31128
Assuring type safety of object-oriented languages
[REPT-92-061] p 3787 N93-31252
Testability of artificial neural networks: A behavioral approach
[REPT-92-047] p 3797 N93-31254
Analysis of fault tolerance in artificial neural networks
[REPT-92-048] p 3797 N93-31255
RLS techniques with generalized forgetting devices for the identification of time-varying systems
[REPT-92-069] p 3810 N93-31463
On the Chebyshev collocation approximation and domain decomposition
[FFI-92/7032] p 3807 N93-31598
Efficient fault diagnosis of helicopter gearboxes
[NASA-TM-106253] p 3735 N93-31846
An analysis of the composition of auroral emissions in the near infrared
[AD-A265493] p 3764 N93-32009
Determination of design and operation parameters for upper atmospheric research instrumentation to yield optimum resolution with deconvolution, appendix 3
[NASA-CR-192835] p 3766 N93-32231
Experimental analysis of computer system dependability
[NASA-CR-193401] p 3785 N93-32233
ERRORS
On the Chebyshev collocation approximation and domain decomposition
[FFI-92/7032] p 3807 N93-31598
Velocities of Thwaites and Land glaciers p 3760 N93-31885
ERS-1 (ESA SATELLITE)
A new view of the sea
[ETN-93-93469] p 3747 N93-32345
ESTIMATING
Digital processing for positioning with one satellite
[ETN-93-93732] p 3685 N93-31318
RLS techniques with generalized forgetting devices for the identification of time-varying systems
[REPT-92-069] p 3810 N93-31463
Efficient estimation of the mean for interval censoring, case 2
[REPT-92-83] p 3811 N93-31491
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 1: Executive summary
[PB93-186062] p 3770 N93-31873
Estimating the spatial extent of attractors of iterated function systems
[AD-A265856] p 3809 N93-32315
ESTUARIES
Florida's estuaries: A citizen's guide to coastal living and conservation
[PB93-189330] p 3751 N93-31113
ETCHING
Low voltage electron beam lithography
[AD-A263360] p 3719 N93-31080
Investigation of diamond homoepitaxy by in situ Fizeau interferometry: The role of oxygen
[AD-A265544] p 3829 N93-31921
ETHERS
Determination of the oxidative stability of perfluoropolyalkyl ethers and correlation with chemical structure
[NASA-TM-106223] p 3712 N93-32367
ETHYL COMPOUNDS
The effect of alkyl substituents on the macrocycle ring on enantiomeric recognition by chiral pyridino-18-crown-6 for 1-naphthylethylamine
[AD-A265513] p 3704 N93-31918
ETHYLENE
New directions for the catalytic conversion of methane
[PB93-188795] p 3702 N93-31435
EUCLIDEAN GEOMETRY
Isocliny, Souillart matrices, quaternions and four-dimensional rotations
[REPT-92-57] p 3813 N93-31502
Geometrical aspects of quaternions and complex numbers
[REPT-92-56] p 3807 N93-31612
EULER EQUATIONS OF MOTION
Contribution to the theoretical study and finite-element approximation of the multidimensional, multispecies, hyperbolic system of gas dynamics
[ESA-TT-1275] p 3724 N93-31429
EUROPE
The effect of changes in markets and trade barriers on the exchange of scientific and technical information p 3836 N93-31216
Automating multilingual communication p 3837 N93-31219
GCM control run of UK Meteorological Office compared with the real climate in the NW European winter
[KNMI-WR-92-02] p 3767 N93-31601
European aerospace science and technology, 1992: A bibliography with indexes
[NASA-SP-7105] p 3671 N93-32404
EUROPEAN SPACE AGENCY
Report on the ESA Interferometry Study Team activities p 3846 N93-31762
EUROPEAN SPACE PROGRAMS
Some European activities in support of the SOHO mission p 3880 N93-31425
EUTECTICS
The effect of porosity and gamma-gamma' eutectic content on the low cycle fatigue behavior of hydrogen-charged PWA-1480 p 3696 N93-31576
EVAPORATION
Calculated mineral precipitation upon evaporation of a model Martian groundwater near 0 C p 3862 N93-31940
EVAPORATIVE COOLING
Transient cooling of a hot surface by droplets evaporation
[PB93-189421] p 3722 N93-31114
EVOLUTION (DEVELOPMENT)
Man, technology, society and development: From the hunters and gatherers to the first industrial revolution 3.5 million years ago into AD1760
[ISBN-9-03-860102-6] p 3833 N93-31543
EXCIMER LASERS
Laser-assisted chemical vapor deposition of InN on Si(100)
[AD-A264266] p 3731 N93-31095
Optical and kinetic processes in excimer lasers
[AD-A264210] p 3733 N93-32402
EXCITATION
String-like excitations in quantum electrodynamics
[DE92-642593] p 3830 N93-31075
Distribution function of excitations in systems with fractional statistics
[DE93-608195] p 3810 N93-31307
EXCITONS
Exciton solitary waves in molecular crystals
[DE93-608693] p 3827 N93-31100
The Optical Stark effect of the exciton due to dynamical coupling between quantized states of the electron and hole in quantum wells
[DE93-608520] p 3819 N93-31665
Chaotic dynamics of high density photon and exciton system
[DE93-608522] p 3819 N93-31666
Excitonic bistabilities, instabilities and chaos in laser-pumped semiconductor
[DE93-608677] p 3731 N93-31669
EXHAUST EMISSION
Climatic effects of turbofan emissions in the stratosphere and the higher troposphere p 3753 N93-31927
Effects of commercial flight pollution on human health p 3753 N93-31931
Relationships between ozone precursor levels and response to emissions reductions: Analysis of regional oxidant model results for the northeastern United States
[PB93-186294] p 3756 N93-32189
EXHAUST GASES
Biological treatment of porous off-gases
[VTT-JULK-766] p 3752 N93-31853
Relationships between ozone precursor levels and response to emissions reductions: Analysis of regional oxidant model results for the northeastern United States
[PB93-186294] p 3756 N93-32189
EXHAUST NOZZLES
Comparison of straight and 15 degree vectored nozzles using a six component thrust stand
[NASA-CR-193291] p 3725 N93-31641
EXHAUST VELOCITY
Engine exhaust characteristics evaluation in support of aircraft acoustic testing
[NASA-TM-104263] p 3682 N93-32220
EXHAUSTING
Flammability and explosion limits of H2 and H2/CO: A literature review
[AD-A264896] p 3702 N93-31064
EXOBIOLOGY
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 377)
[NASA-SP-7011(377)] p 3773 N93-31924
EXOSKELETONS
Integration of advanced teleoperation technologies for control of space robots p 3784 N93-32107
EXOTHERMIC REACTIONS
Structure and properties of energetic materials
[AD-A265775] p 3713 N93-31800
EXPANSION
Revision by expansion in logic programs
[REPT-93-02] p 3790 N93-31852
EXPEDITIONS
Field and laboratory investigations of Antarctic meteorites collected by United States expeditions, 1985-1987
[PB93-182723] p 3861 N93-32415
EXPERT SYSTEMS
Investigations into database management system support for expert system shells, volumes 1 and 2 p 3835 N93-31108
Testability of artificial neural networks: A behavioral approach
[REPT-92-047] p 3797 N93-31254

Analysis of fault tolerance in artificial neural networks
[REPT-92-048] p 3797 N93-31255
DIAC at TWI
[REPT-92-77] p 3787 N93-31472
Expert system development for probabilistic load simulation p 3695 N93-31570
Quality support tool of simulation models: A comparison between methodology
[REPT-92-061/BIS] p 3839 N93-31605
The Delfi3 debugger: Notes on the implementation
[REPT-92-106] p 3790 N93-31850
Automated assembly of large space structures using an expert system executive p 3690 N93-32102
Integration of domain and resource-based reasoning for real-time control in dynamic environments
p 3794 N93-32141
An on-line expert system for diagnosing environmentally induced spacecraft anomalies using CLIPS
p 3794 N93-32142
DESSY: Making a real-time expert system robust and useful p 3794 N93-32146
Enhancements to the Engine Data Interpretation System (EDIS)
[NASA-CR-193363] p 3800 N93-32230
A neural network approach to seismic phase identification
[DE93-013601] p 3800 N93-32305
Investigation of advanced technology for airway facilities maintenance training
[DOT/FAA/CT-TN92/24] p 3678 N93-32336
Initial definition of a Knowledge-Based Software Quality Assistant
[AD-A265866] p 3793 N93-32418

EXPLOSIONS
Flammability and explosion limits of H2 and H2/CO: A literature review
[AD-A264896] p 3702 N93-31064
Structure and properties of energetic materials
[AD-A265775] p 3713 N93-31800
Integration of measurements with atmospheric dispersion models: Source term estimation for dispersal of (239)Pu due to non-nuclear detonation of high explosive
[DE93-012550] p 3766 N93-32295

EXPLOSIVES
NTO polymorphs
[DE93-005451] p 3712 N93-31186
Commissioning and operating instructions of one pint (US) mixer
[MRL-TN-634] p 3713 N93-31639
Structure and properties of energetic materials
[AD-A265775] p 3713 N93-31800
Advances in Analysis and Detection of Explosives. Proceedings of the 4th International Symposium on Analysis and Detection of Explosives
[AD-A265002] p 3713 N93-32077

EXTRACTION
Kinetics of mediated electron transfer between viologen groups in a self-assembled monolayer and metal complexes in solution
[AD-A265729] p 3820 N93-31797
Effect of DCB extraction on Mossbauer and spectral data for a Hawaiian palagonitic soil (PN-9): Iden tification of pigmentary phases p 3864 N93-31950

EXTRAPOLATION
Infinite volume extrapolations of finite cluster calculations. How correct are these?
[AD-A265648] p 3809 N93-32170

EXTRASOLAR PLANETS
Searching for exoplanets p 3846 N93-31760
SISTERS: A space interferometer for the search for terrestrial exo-planets by rotation shearing
p 3846 N93-31764

EXTRAVEHICULAR ACTIVITY
A vision system planner for increasing the autonomy of the Extravehicular Activity Helper/Retriever
[NASA-CR-193301] p 3777 N93-31844
Potential roles for EVA and telerobotics in a unified worksite p 3690 N93-32118

EXTREME ULTRAVIOLET EXPLORER SATELLITE
Decision-theoretic control of EUVE telescope scheduling p 3835 N93-32134

EXTREME ULTRAVIOLET RADIATION
SUMER: Temperatures, densities, and velocities in the outer solar atmosphere p 3867 N93-31346
The coronal diagnostic spectrometer for the Solar and Heliospheric Observatory p 3868 N93-31347
Solar corona synoptic observations from SOHO with an extreme ultraviolet imaging telescope
p 3868 N93-31348
Observations of the solar corona with a high resolution EUV imaging spectrograph p 3875 N93-31390
A diagnostic method for reconnecting magnetic fields in the solar corona p 3877 N93-31406
Abundance determination in the quiet corona
p 3877 N93-31407

EXTREMELY HIGH FREQUENCIES
EHF military communication satellite alternatives study
[SS/L-TR00775] p 3716 N93-31311

EXTREMELY LOW RADIO FREQUENCIES
Energetics of ULF/ELF plasma waves in the solar wind and outer Earth's magnetosphere p 3826 N93-31689
Can ULF fluctuations observed at the magnetopause play a role in anomalous diffusion?
p 3855 N93-31693
Mirror mode and other compressive ULF modes
p 3719 N93-31711

F

F REGION
Studies of global ionospheric electrodynamics
[AD-A265033] p 3764 N93-31997
The effects of magnetic storm phases on F-layer irregularities from auroral to equatorial latitudes
[AD-A264908] p 3764 N93-32094

F-16 AIRCRAFT
Supersonic aerodynamic characteristics of an advanced F-16 derivative aircraft configuration
[NASA-TP-3355] p 3673 N93-31733

FABRICATION
The development of SiC whisker fabrication technology for nuclear applications
[DE93-605320] p 3710 N93-31828
Satellite Test Assistant Robot (STAR)
p 3690 N93-32111

FABRICS
Analysis of effective thermal conductivity of fibrous materials
[NASA-CR-193242] p 3709 N93-31636

FABRY-PEROT INTERFEROMETERS
Multi-quantum well lateral-field-effect electro-refraction modulator
[AD-A264411] p 3729 N93-31191
The Large Angle Spectroscopic Coronagraph (LASCO): Visible light coronal imaging and spectroscopy
p 3868 N93-31350
On the Fabry-Perot investigations of the solar corona: Eclipse observations of the green line intensities and half widths p 3872 N93-31375

FACSIMILE COMMUNICATION
Standardization Directory: FSC class and area assignments
[AD-A265686] p 3839 N93-31796

FACTOR ANALYSIS
The cube rotation test: A computer generated process for acquisition of mental spatial manipulator capability
p 3776 N93-31237
Source apportionment of air pollution in China: Extending the usefulness of receptor modeling by combining multivariate and chemical mass balance models
[PB93-185726] p 3756 N93-32188

FACTORIAL DESIGN
Building Hadamard matrices in steps of 4 to order 200
[PB93-189835] p 3786 N93-31200

FACTORIZATION
Optimal solutions to a two-block H infinity problem
[MEMO-1080] p 3798 N93-31468
Necessary and sufficient conditions for J-spectral factorizations with a J-lossless property for infinite-dimensional systems in continuous and discrete time
[W-9217] p 3798 N93-31512
Analytic system problems and J-lossless factorization for infinite-dimensional linear systems
[W-9218] p 3798 N93-31513
Robust stabilization of infinite-dimensional systems with respect to coprime factor perturbations
[W-9220] p 3805 N93-31514

FAILURE
On the design of fault-tolerant robotic manipulator systems p 3737 N93-32125

FAILURE ANALYSIS
Cumulative fatigue damage behavior of MAR M-247
p 3696 N93-31575
A mechanics model for the compressive response of fiber reinforced composites
[AD-A265556] p 3701 N93-32067
DESSY: Making a real-time expert system robust and useful p 3794 N93-32146
Experimental analysis of computer system dependability
[NASA-CR-193401] p 3785 N93-32233
The development of a tungsten heavy alloy that fails by an adiabatic shear mechanism, phase 1
[AD-A265867] p 3707 N93-32318

FALSE ALARMS
Parametric and combinatorial problems in constrained optimization
[AD-A265595] p 3792 N93-32096
Fire protection for launch facilities using machine vision fire detection p 3687 N93-32113

FAN BLADES
Blasim: A computational tool to assess ice impact damage on engine blades
[NASA-TM-106225] p 3740 N93-31193

FAR FIELDS
Report of the working group on far field accelerators
[AD-A265443] p 3732 N93-32021

FAR INFRARED RADIATION
The 1st International Conference on Millimeter Wave and Far-Infrared Technology
[AD-A264268] p 3715 N93-31096

FAR ULTRAVIOLET RADIATION
Some European activities in support of the SOHO mission p 3880 N93-31425

FAST FOURIER TRANSFORMATIONS
Fast Fourier Transform analysis of computer-acquired friction data
[DE93-010337] p 3736 N93-32179

FATIGUE (BIOLOGY)
Subjective mood and fatigue of C-141 crew during Desert Storm p 3782 N93-32264
Digital flight data as a measure of pilot performance associated with fatigue from continuous operations during the Persian Gulf conflict p 3782 N93-32268

FATIGUE (MATERIALS)
Material characterization and fractographic examination of Ti-17 fatigue crack growth specimens for SMP SC33
p 3681 N93-31744
Fatigue crack growth results for Ti-6Al-4V, IMI 685, and Ti-17 p 3682 N93-31746
Conclusions and recommendations
p 3682 N93-31749

FATIGUE LIFE
Probabilistic fracture finite elements
p 3695 N93-31571
Overview of the fatigue/fracture/life prediction working group program at the Lewis Research Center
p 3696 N93-31574
Cumulative fatigue damage behavior of MAR M-247
p 3696 N93-31575
The effect of porosity and gamma-gamma' eutectic content on the low cycle fatigue behavior of hydrogen-charged PWA-1480 p 3696 N93-31576
A model for predicting high-temperature fatigue failure of a W/Cu composite p 3696 N93-31579
Axial and torsional fatigue behavior of a cobalt-base alloy p 3697 N93-31582
Damage severity of monitored fatigue load spectra
[NLR-TP-92009-U] p 3679 N93-32205
Low cycle fatigue behaviour of titanium disc alloys
[NLR-TP-91346-U] p 3683 N93-32372

FATIGUE TESTS
High cycle fatigue of glass fibre reinforced epoxy materials for wind turbines
[DLR-FB-92-17] p 3700 N93-31461
Cumulative fatigue damage behavior of MAR M-247
p 3696 N93-31575
AGARD Engine Disc Cooperative Test Programme
[AGARD-R-766-ADD] p 3681 N93-31741
Fractographic and microstructural analysis of fatigue crack growth in Ti-6Al-4V fan disc forgings
p 3681 N93-31742
Low cycle fatigue behaviour of titanium disc alloys
p 3682 N93-31745
Crack growth prediction results p 3682 N93-31748
Efficient fault diagnosis of helicopter gearboxes
[NASA-TM-106253] p 3735 N93-31846

FAULT TOLERANCE
Testability of artificial neural networks: A behavioral approach
[REPT-92-047] p 3797 N93-31254
Analysis of fault tolerance in artificial neural networks
[REPT-92-048] p 3797 N93-31255
Development and flight testing of a fault-tolerant fly-by-light yaw control system p 3676 N93-31280
Advanced launch system multi-path redundant avionics architecture analysis and characterization
[NASA-CR-4516] p 3795 N93-31642
The implementation of the digital wave processor for the ESA/NASA Cluster mission p 3858 N93-31708
Automatic specification of reliability models for fault-tolerant computers
[NASA-TP-3301] p 3812 N93-31869
On the design of fault-tolerant robotic manipulator systems p 3737 N93-32125
Experimental analysis of computer system dependability
[NASA-CR-193401] p 3785 N93-32233

FEASIBILITY
Generation and exploration of aggregation abstractions for scheduling and resource allocation
p 3835 N93-32128

FEASIBILITY ANALYSIS
System study of tether technology with particular consideration of transport utilization possibilities in space transportation
[ILR-MITT-270(1992)] p 3685 N93-31207
Fusion energy for space: Feasibility demonstration. A proposal to NASA
[NASA-TM-109227] p 3825 N93-31309
Maglev guideway route alignment and right-of-way requirements
[PB93-154854] p 3735 N93-31592
Study survey on a high-efficiency environment harmony type energy cascade utilization system
[DE93-768469] p 3748 N93-31812
Study on new biomass energy systems
[DE93-768470] p 3749 N93-32057
Feasibility study on introduction of petroleum substituting energy for transportation
[DE93-768472] p 3750 N93-32058
Maglev program test plan
[PB93-154904] p 3736 N93-32194
Constrained motion models for insertion/extraction operations applied to the Hermes robot arm: A feasibility study
[NLR-TP-91485-U] p 3736 N93-32204

FEEDBACK
Integration of advanced teleoperation technologies for control of space robots p 3784 N93-32107
Robust stability of second-order systems
[NASA-CR-193624] p 3809 N93-32373

FEEDBACK CONTROL
Estimation and control in discrete-time nonlinear systems p 3797 N93-31071
Analysis of the compliant motion achievable with an industrial robot: Identification, feedback and design
[OUEL-1899/91] p 3733 N93-31150
Tethered systems control p 3689 N93-31453
The linear quadratic digital control of infinite-dimensional systems with unbounded input and output operators
[REPT-92-49] p 3798 N93-31483
Disturbance decoupling by measurement feedback for structured systems: A graph theoretical approach
[REPT-92-53] p 3805 N93-31487
Sampled-data and discrete-time H2 optimal control
[W-9222] p 3798 N93-31525
Graph theoretic methods for the computation of disturbance decoupling feedback matrices for structured systems
[REPT-92-54] p 3789 N93-31614
H infinity-control with measurement-feedback for Pritchard-Salamon system
[W-9211] p 3799 N93-31628
A comparison of force control algorithms for robots in contact with flexible environments
[NASA-CR-193251] p 3789 N93-31638
Optimal fixed-finite-dimensional compensator for Burgers' equation with unbounded input/output operators
[NASA-CR-191454] p 3808 N93-31857
Robust stability of second-order systems
[NASA-CR-193624] p 3809 N93-32373
Nonlinear disturbance decoupling and linearization: A partial interpretation of integral feedback
[MEMO-1093] p 3801 N93-32400

FEMALES
An annotated bibliography of research involving women, conducted at the US Army Research Institute of Environmental Medicine
[AD-A265497] p 3773 N93-31917

FERMI LIQUIDS
Microscopic origin of marginal Fermi-liquid in strongly correlated spin systems
[DE93-608697] p 3827 N93-31163

FERMIONS
On the magnetoresistance of heavy fermion compounds
[DE93-608691] p 3827 N93-31098
The Lipkin model second order phase transition in the deformed su(2) algebra description
[DE93-608201] p 3807 N93-31661

FERMIUM
Random walks and a simple chirally invariant lattice Hamiltonian without fermion doubling
[DE93-609920] p 3821 N93-31913

FERROELECTRICITY
Hierarchical textures in ferroelectric crystals
[DE93-608938] p 3827 N93-31175
Relaxational dynamics and precursor domains in the non-linear shell model
[DE92-642676] p 3820 N93-31805

FETUSES
Organization of the human circadian system
[AD-A264675] p 3774 N93-32015

FEYNMAN DIAGRAMS
HELAS: HELicity amplitude subroutines for Feynman diagram evaluations
[DE93-715538] p 3813 N93-31166
Differential equations method: The calculation of N (N greater than 2)-points diagrams
[DE93-609887] p 3814 N93-32412

FIBER COMPOSITES
Compressive strengths of fiber-reinforced composites with interface debonding p 3699 N93-31136
SiC fiber-reinforced Celsian glass-ceramic matrix composite
[NASA-CASE-LEW-15264-1] p 3700 N93-31293
Method of producing a ceramic fiber-reinforced glass-ceramic matrix composite
[NASA-CASE-LEW-15264-2] p 3700 N93-31299
Long-term reliability of gas pipeline repairs by reinforced composites. Annual report, July 1991-June 1992
[PB93-188647] p 3700 N93-31334
Impact response of laminated plates subjected to transverse loading p 3740 N93-31645
Design of multiple-ply laminated composite tapered beams
[NASA-TM-108411] p 3700 N93-31650
Composites design handbook: Update
[ESA-PSS-03-1101-ISSUE-1-RE] p 3701 N93-31740
A mechanics model for the compressive response of fiber reinforced composites
[AD-A265556] p 3701 N93-32067
Damping mechanisms in chemically vapor deposited SiC fibers
[NASA-TM-109236] p 3701 N93-32219
Buckling and postbuckling of stiffened thin skinned carbon fibre composite panels
[ATN-9301] p 3742 N93-32331

FIBER OPTICS
Development and flight testing of a fault-tolerant fly-by-light yaw control system p 3676 N93-31280
Integrated optics for an interferometric link p 3824 N93-31783
IR single-mode fiber optics for double Fourier interferometry p 3824 N93-31784
Development of jitter measurement procedures for digital fiber optic modules
[AD-A265550] p 3824 N93-31915

FIBER ORIENTATION
Internal structural characterization
[AD-A264762] p 3738 N93-31982
A thermoelastic model for thick composite rings
[AD-A264112] p 3701 N93-32029
A mechanics model for the compressive response of fiber reinforced composites
[AD-A265556] p 3701 N93-32067

FIELD ALIGNED CURRENTS
A comparison of the dynamical signatures of coronal heating mechanisms p 3875 N93-31394

FIELD EFFECT TRANSISTORS
Synthesis and realization of a monolithic active bandpass filter for the Ku band
[LAAS-92365] p 3719 N93-31173
Noise attenuating circuit for mechanical relay including optical isolation
[AD-D015700] p 3720 N93-31842
DLTS and dynamic transconductance analysis of deep-submicron fully-depleted SOI MOSFETs
[AD-A264888] p 3721 N93-31984
Numerical studies of low temperature gallium arsenide buffer layers and their influence on device operation
[AD-A264296] p 3829 N93-32083

FIELD INTENSITY METERS
Investigation of fine-scale aurora with the Freja electric field instrument p 3860 N93-31719

FIELD OF VIEW
SeaWiFS Technical Report Series. Volume 4: An analysis of GAC sampling algorithms: A case study
[NASA-TM-104566-VOL-4] p 3771 N93-32360

FIELD THEORY (PHYSICS)
Ashtekar variables, self-dual metrics, and w(infinity)
[DE92-642588] p 3802 N93-31074
Non-standard representations of the space-time groups and their applications to the dynamical theory of elementary particles
[DE93-608203] p 3818 N93-31240
Distribution function of excitations in systems with fractional statistics
[DE93-608195] p 3810 N93-31307
The constraint for the lowest Landau level and the effective field theory approach for the fractional quantum hall system
[DE93-608200] p 3831 N93-31509
Supersymmetric construction of W-algebras from super Toda and WZNW theories
[DE93-608244] p 3808 N93-31819
Hamiltonian moments and the Lanczos method in the Heisenberg model
[DE93-609845] p 3813 N93-31905
Plaquette expansion in lattice Hamiltonian models
[DE93-609846] p 3813 N93-31906

FIGHTER AIRCRAFT
Damage severity of monitored fatigue load spectra
[NLR-TP-92009-U] p 3679 N93-32205
Development of a method to predict transonic limit cycle oscillation characteristics of fighter aircraft
[NLR-TP-91359-U] p 3679 N93-32338

FINANCIAL MANAGEMENT
Information systems strategies for public financial management
[PB93-186948] p 3842 N93-32167

FINE STRUCTURE
Multiple flows in the solar transition region p 3857 N93-31704
Investigation of fine-scale aurora with the Freja electric field instrument p 3860 N93-31719

FINGERS
Prevention of cumulative trauma disorders
[PB93-188332] p 3773 N93-31138

FINITE DIFFERENCE THEORY
Temperature dependence of the femtosecond optical response in doped high temperature superconductors
[DE93-009514] p 3829 N93-31988
Knowledge-based software development tools
[AD-A265218] p 3791 N93-32059
Ceramics models in the MESA codes
[DE93-000683] p 3711 N93-32186
Modeling of optical waveguide biosensor structures
[VTT-PUBS-112] p 3824 N93-32421

FINITE ELEMENT METHOD
Development of nose structure of a reconnaissance container for a supersonic jet aircraft
[MBB-LME-242-S-PUB-0451] p 3679 N93-31046
Deformation analysis of welded joints
[ETN-93-94199] p 3739 N93-31057
Eddy vortices produced by nonlinear reflection of a gravity wave at a critical level p 3757 N93-31155
Blasim: A computational tool to assess ice impact damage on engine blades
[NASA-TM-106225] p 3740 N93-31193
Perforated carbon-epoxy plates damage modeling for quasi-static biaxial loading
[ESA-TT-1273] p 3740 N93-31428
Contribution to the theoretical study and finite-element approximation of the multidimensional, multispecies, hyperbolic system of gas dynamics
[ESA-TT-1275] p 3724 N93-31429
Probabilistic evaluation of SSME structural components p 3694 N93-31565
Probabilistic fracture finite elements p 3695 N93-31571
Mapping methods for computationally efficient and accurate structural reliability p 3695 N93-31572
Modeling ice streams: Derived quantities p 3763 N93-31904
Effects of surface defects on the local electric field in inhomogeneous media
[DE93-011035] p 3830 N93-32182
Civil tiltrotor transport point design: Model 940A
[NASA-CR-191446] p 3701 N93-32234
Basic structural dynamics p 3741 N93-32271
A p-version finite element method for steady incompressible fluid flow and convective heat transfer
[NASA-TM-106260] p 3727 N93-32370

FINITE VOLUME METHOD
The ViB-code to simulate 3-D stator/rotor flow in axial turbines
[DLR-FB-92-19] p 3681 N93-31170
Finite volume methods constructed by mixed variational formulation. Part 2: Error estimates in discrete energetic norms
[REPT-92-86] p 3805 N93-31488
Finite volume methods constructed by mixed variational formulation. Part 1: Description of the discretization technique
[REPT-92-85] p 3805 N93-31489
Multigrid schemes for time-dependent incompressible Navier-Stokes equations
[REPT-92-102] p 3725 N93-31657

FINNED BODIES
Low-speed wind tunnel study of the direct side-force characteristics of a joined-wing airplane with an upper fin
[DE93-767966] p 3672 N93-31189
Navier-Stokes computations for kinetic energy projectiles in steady coning motion: A predictive capability for pitch damping
[AD-A264111] p 3726 N93-32028

FIRE FIGHTING
Transient cooling of a hot surface by droplets evaporation
[PB93-189421] p 3722 N93-31114

FIRE PREVENTION
Fire protection for launch facilities using machine vision fire detection p 3687 N93-32113

FIRES
Fire protection for launch facilities using machine vision fire detection p 3687 N93-32113
FIRMWARE
System engineering concept demonstration, effort summary, volume 1
[AD-A265467] p 3791 N93-32022
FISHERIES
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 3: Appendices
[PB93-186088] p 3771 N93-32308
FIXTURES
Large angle magnetic suspension test fixture
[NASA-CR-193123] p 3684 N93-31836
FLAMES
Advanced infrared spectroscopy for improved characterization of chemical systems
[PB93-174977] p 3703 N93-31875
FLAMMABILITY
Flammability and explosion limits of H2 and H2/CO: A literature review
[AD-A264896] p 3702 N93-31064
FLAVOR (PARTICLE PHYSICS)
Massive neutrinos
[DE93-609989] p 3821 N93-32026
FLEXIBLE BODIES
Modified dynamics modelling for maneuvering flexible space manipulators
[NLR-TP-91280-U] p 3737 N93-32333
FLEXIBLE SPACECRAFT
Stanford Aerospace Research Laboratory research overview p 3690 N93-32103
Fuzzy based attitude controller for flexible spacecraft with on/off thrusters
[NASA-CR-188250] p 3690 N93-32228
FLEXING
Vibrational power transmission in curved beams. Part 1: Theory
[ISVR-TR-208] p 3742 N93-32340
FLIGHT ALTITUDE
Radiation exposure in aircraft p 3753 N93-31928
FLIGHT CHARACTERISTICS
The DLR test aircraft in the FZ-BS, -VFW 614/ATTAS, Dornier DO 228-101, MBB BO105 S-3 p 3675 N93-31272
FLIGHT CONDITIONS
Preliminary evaluation of aviation-impact variables derived from numerical models
[PB93-190197] p 3767 N93-31202
FLIGHT CONTROL
Ground installations for preparation and evaluation of flight tests p 3675 N93-31274
ATTAS experimental-cockpit and ATMOS for component and system investigations in flight guidance p 3676 N93-31276
Ground- and satellite-derived flight-path measurements as demonstrated in the AFES Avionics Flight Evaluation System (AFES) p 3677 N93-31281
Installations and methods for measurement of aircraft radio components and systems p 3677 N93-31284
Current projects in Fuzzy Control p 3688 N93-31442
Proximity operations in space station environment p 3689 N93-31449
Fuzzy based attitude controller for flexible spacecraft with on/off thrusters
[NASA-CR-188250] p 3690 N93-32228
FLIGHT CREWS
Abridged procedural guide to aircrew anthropometric accommodation assessment
[AD-A265220] p 3777 N93-32006
Application and validation of workload assessment techniques
[AD-A264575] p 3777 N93-32012
Nutrition, Metabolic Disorders and Lifestyle of Aircrew
[AGARD-CP-533] p 3777 N93-32240
Nutrition for a typical MAC crew during Desert Storm p 3778 N93-32245
Changes in food and energy intake in military aircrew p 3778 N93-32246
Lipodystrophies in the French military flight crew p 3774 N93-32249
Blood lipids in aircrew recruits and in RAF aviators p 3774 N93-32251
The effects of an antijet lag diet p 3781 N93-32263
Subjective mood and fatigue of C-141 crew during Desert Storm p 3782 N93-32264
C-141 aircrew sleep and fatigue during the Persian Gulf conflict p 3782 N93-32265
Digital flight data as a measure of pilot performance associated with fatigue from continuous operations during the Persian Gulf conflict p 3782 N93-32268
Effects of caffeine on mental performance and mood: Implications for aircrew members p 3783 N93-32269
The X-15/HL-20 operations support comparison
[NASA-TM-4453] p 3687 N93-32379
FLIGHT FATIGUE
C-141 aircrew sleep and fatigue during the Persian Gulf conflict p 3782 N93-32265
FLIGHT HAZARDS
Airborne derivation of microburst alerts from ground-based Terminal Doppler Weather Radar information: A flight evaluation
[NASA-TM-108990] p 3680 N93-32223
FLIGHT MANAGEMENT SYSTEMS
Instigation and processing of flight tests in DLR p 3675 N93-31275
Testing of an experimental FMS p 3676 N93-31277
FLIGHT PATHS
Ground- and satellite-derived flight-path measurements as demonstrated in the AFES Avionics Flight Evaluation System (AFES) p 3677 N93-31281
On-board derived flight-path measurement as demonstrated by an ILS measurement system p 3677 N93-31282
Flight evaluation of a computer aided low-altitude helicopter flight guidance system
[NASA-TM-103998] p 3678 N93-32225
FLIGHT RECORDERS
Digital flight data as a measure of pilot performance associated with fatigue from continuous operations during the Persian Gulf conflict p 3782 N93-32268
FLIGHT SAFETY
Airborne derivation of microburst alerts from ground-based Terminal Doppler Weather Radar information: A flight evaluation
[NASA-TM-108990] p 3680 N93-32223
Human factors and the safety of flights: The importance of the management of sleep p 3782 N93-32267
UK airmisses involving commercial air transport, September - December 1991
[ETN-93-93930] p 3674 N93-32409
FLIGHT SIMULATION
Testing of an experimental FMS p 3676 N93-31277
Pallet for helicopter test instrumentation p 3676 N93-31279
Fractographic and microstructural analysis of fatigue crack growth in Ti-6Al-4V fan disc forgings p 3681 N93-31742
A high-fidelity, six-degree-of-freedom batch simulation environment for tactical guidance research and evaluation
[NASA-TM-4440] p 3684 N93-32380
FLIGHT SIMULATORS
The DLR test aircraft in the FZ-BS, -VFW 614/ATTAS, Dornier DO 228-101, MBB BO105 S-3 p 3675 N93-31272
Application and validation of workload assessment techniques
[AD-A264575] p 3777 N93-32012
FLIGHT STRESS (BIOLOGY)
Subjective mood and fatigue of C-141 crew during Desert Storm p 3782 N93-32264
FLIGHT TEST INSTRUMENTS
The application of phase tracking GPS for flight test trajectory determination
[NLR-TP-91349-U] p 3678 N93-32337
FLIGHT TESTS
Flight test of avionic and air-traffic control systems
[ESA-TT-1279] p 3675 N93-31271
The DLR test aircraft in the FZ-BS, -VFW 614/ATTAS, Dornier DO 228-101, MBB BO105 S-3 p 3675 N93-31272
Ground installations for preparation and evaluation of flight tests p 3675 N93-31274
Instigation and processing of flight tests in DLR p 3675 N93-31275
Testing of an experimental FMS p 3676 N93-31277
Pallet for helicopter test instrumentation p 3676 N93-31279
Development and flight testing of a fault-tolerant fly-by-light yaw control system p 3676 N93-31280
Ground- and satellite-derived flight-path measurements as demonstrated in the AFES Avionics Flight Evaluation System (AFES) p 3677 N93-31281
Installations and methods for measurement of aircraft radio components and systems p 3677 N93-31284
Effects of an aft facing step on the surface of a laminar flow glider wing
[NASA-CR-193302] p 3673 N93-31855
Space Shuttle Orbiter thermal protection system design and flight experience
[NASA-TM-104773] p 3727 N93-32198
Engine exhaust characteristics evaluation in support of aircraft acoustic testing
[NASA-TM-104263] p 3682 N93-32220
Airborne derivation of microburst alerts from ground-based Terminal Doppler Weather Radar information: A flight evaluation
[NASA-TM-108990] p 3680 N93-32223
Flight evaluation of a computer aided low-altitude helicopter flight guidance system
[NASA-TM-103998] p 3678 N93-32225
Instrumentation for in-flight acoustic measurements in an engine inlet duct of a Fokker 100 aircraft
[NLR-TP-91200-U] p 3680 N93-32332
Evaluation of the flyability of MLS curved approaches for wide-body aircraft
[NLR-TP-91396-U] p 3680 N93-32416
FLIGHT TRAINING
Mandatory multi-engined training syllabus
[CAP-601] p 3776 N93-31729
FLOATING POINT ARITHMETIC
On the Chebyshev collocation approximation and domain decomposition
[FFI-92/7032] p 3807 N93-31598
FLORIDA
Florida's estuaries: A citizen's guide to coastal living and conservation
[PB93-189330] p 3751 N93-31113
FLOW CHARACTERISTICS
Penn State axial flow turbine facility: Performance and nozzle flow field p 3698 N93-31588
The prediction of noise from co-axial jets
[ISVR-TR-215] p 3817 N93-32339
FLOW CHARTS
Z through pictures
[RSRE-MEMO-4587] p 3787 N93-31337
Object oriented application flow graphs and their semantics
[CT-92-01] p 3788 N93-31528
FLOW DISTRIBUTION
TDLM: A Transonic Doublet Lattice Method for 3D potential unsteady transonic flow calculation
[DLR-FB-92-25] p 3671 N93-31171
Fluid flow visualization
[REPT-92-69] p 3724 N93-31494
Penn State axial flow turbine facility: Performance and nozzle flow field p 3698 N93-31588
Measurements and computational analysis of heat transfer and flow in a simulated turbine blade internal cooling passage
[NASA-TM-106189] p 3725 N93-31647
Reynolds number influences in aeronautics
[NASA-TM-107730] p 3673 N93-31732
Pulse holographic measurement techniques
[DE93-607634] p 3729 N93-31835
Radiation/convection coupling in rocket motor and plume analysis
[NASA-CR-193288] p 3698 N93-31845
Evolution of area-averaged vertical velocity in the convective region of a midlatitude squall line
[AD-A265333] p 3768 N93-32063
FLOW EQUATIONS
F2D: A two-dimensional compressible gas flow code
[DE93-003239] p 3723 N93-31169
Tidally averaged models for dispersion in shallow water
[REPT-92-66] p 3769 N93-31497
FLOW MEASUREMENT
Turbulence measurement in a reacting and non-reacting shear layer at a high subsonic Mach number
[NASA-TM-106186] p 3673 N93-31839
FLOW REGULATORS
Innovative instrument design and applications in super-critical fluid chromatography and extraction p 3704 N93-32327
FLOW RESISTANCE
Study of pipe friction reduction materials for gas transportation.
[PB93-189181] p 3724 N93-31438
FLOW STABILITY
Structure and stability of reacting compressible free shear layers
[AD-A265594] p 3727 N93-32095
FLOW VELOCITY
The influence of variable flow velocity on unsteady airfoil behavior
[DLR-FB-92-22] p 3672 N93-31320
Simulated O VI Doppler dimming measurements of coronal outflow velocities p 3871 N93-31367
FLOW VISUALIZATION
A break-down of sting interference effects
[NLR-TP-91220-U] p 3684 N93-31042
Fluid flow visualization
[REPT-92-69] p 3724 N93-31494
Pulse holographic measurement techniques
[DE93-607634] p 3729 N93-31835
FLUE GASES
Proceedings: 1991 SO2 Control Symposium, volume 2, sessions 4 and 5A
[PB93-196103] p 3754 N93-32090
Proceedings: 1991 SO2 Control Symposium, volume 3, sessions 5B and 6
[PB93-196111] p 3755 N93-32091

Proceedings: 1991 SO2 Control Symposium, volume 4, session 7
[PB93-196129] p 3755 N93-32092
Proceedings: 1991 SO2 Control Symposium, volume 5, session 8
[PB93-196137] p 3755 N93-32093
Proceedings of the 1991 SO2 Control Symposium, volume 1
[PB93-196095] p 3755 N93-32168

FLUID FILMS
Design review of fluid film bearing testers
[NASA-CR-193299] p 3735 N93-31731

FLUID FILTERS
Microbiological test results of the environmental control and life support systems vapors compression distillation subsystem recycle tank components following various pretreatment protocols
[NASA-CR-192570] p 3772 N93-32354

FLUID FLOW
Fluid flow visualization
[REPT-92-69] p 3724 N93-31494
Reynolds number influences in aeronautics
[NASA-TM-107730] p 3673 N93-31732
Understanding heat and fluid flow in linear GTA welds
[DE93-012958] p 3727 N93-32303
The application of remotely sensed data to studies of volcanism within the Galapagos Islands
p 3747 N93-32326

FLUID INJECTION
Enhancement of single phase forced convection heat transfer in tubes and ducts using tangential flow injection
[PB93-189975] p 3723 N93-31210

FLUID PRESSURE
Excitation by flows in seals and clearances. Part 1: Introduction: Fluid-structure-interactions in rotordynamics. Part 2: Identification of rotordynamic coefficients of annular seals p 3738 N93-32275
Perturbation technique for identification of the lowest modes of rotors with fluid interaction
p 3738 N93-32277

FLUID-SOLID INTERACTIONS
Modal synthesis technique used in shallow doublewall
[FFA-TN-1992-29] p 3722 N93-31053

FLUORESCENCE
Modeling of optical waveguide biosensor structures
[VTT-PUBS-112] p 3824 N93-32421

FLUORIDES
Development of technical processes for manufacturing heavy metal fluoride glass fibers
[ETN-93-94200] p 3707 N93-31047

FLUTTER
Integrated structural design, vibration control, and aeroelastic tailoring by multiobjective optimization
p 3739 N93-31137
TDLM: A Transonic Doublet Lattice Method for 3D potential unsteady transonic flow calculation
[DLR-FB-92-25] p 3671 N93-31171

FLUX DENSITY
Gas arc constriction for plasma arc welding
[NASA-CASE-MFS-28844-1] p 3734 N93-31292
Microflares observed with UVSP and HXIS
p 3877 N93-31405
On the solar wind-magnetosphere-ionosphere coupling: AMPTE/CCE particle data and the AE indices
p 3856 N93-31701

FLUX PINNING
Study of improved critical currents and mechanical properties in YBaCuO superconductor with Ag or 211
[AD-A265749] p 3829 N93-31804

FLUX TRANSFER EVENTS
Distinct ion population in the polar cusp: Possible signature of transient reconnection
p 3766 N93-31680
Magnetic field reconnection at the dayside magnetopause p 3855 N93-31696
An investigation of dayside FTE's observed by the AMPTE-UKS satellite p 3858 N93-31709

FLY BY WIRE CONTROL
Development and flight testing of a fault-tolerant fly-by-light yaw control system p 3676 N93-31280

FLYING PERSONNEL
Biological parameters and cardiovascular risk factors with the flying personnel of the Belgian Armed Forces
p 3781 N93-32260

FOCUSING
Development of high resolution imaging detectors for x ray astronomy
[NASA-CR-193653] p 3851 N93-32363

FOKKER AIRCRAFT
Instrumentation for in-flight acoustic measurements in an engine inlet duct of a Fokker 100 aircraft
[NLR-TP-91200-U] p 3680 N93-32332

FOOD CHAIN
Annual report of the National Institute of Radiological Sciences
[DE93-704237] p 3820 N93-31810

FOOD INTAKE
Nutrition for a typical MAC crew during Desert Storm
p 3778 N93-32245
Changes in food and energy intake in military aircrew
p 3778 N93-32246
Idiopathic Reactive Hypoglycemia in a population of healthy trainees of an Italian Air Force military school
p 3779 N93-32248
Objective improvements obtained by control of diet and physical training in Spanish Air Force fighter pilots
p 3780 N93-32258
The effects of an antijet lag diet p 3781 N93-32263

FOOTPRINTS
Evolution and oscillations of coronal loops
p 3876 N93-31395

FORCED CONVECTION
Enhancement of single phase forced convection heat transfer in tubes and ducts using tangential flow injection
[PB93-189975] p 3723 N93-31210

FORECASTING
A neural network approach to seismic phase identification
[DE93-013601] p 3800 N93-32305

FOREST MANAGEMENT
Indigenous views of land and the environment
[PB93-186898] p 3755 N93-32166

FORESTS
Chemistry and acidity of cloud water at Mount Washington, NH
[PB93-190684] p 3767 N93-31206
A scintillation experiment over a forest
[KNMI-WR-92-04] p 3746 N93-31595
Central Africa: Global climate change and development
[PB93-179612] p 3768 N93-31871

FORTRAN
Software engineering p 3794 N93-32154
High performance FORTRAN without templates: An alternative model for distribution and alignment
[NASA-CR-191451] p 3792 N93-32323

FOSSILS
Macrofossil records of West Antarctic Ice Sheet retreat during the Holocene p 3759 N93-31881

FOURIER TRANSFORMATION
IR single-mode fiber optics for double Fourier interferometry p 3824 N93-31784
Infrared multiple photon dissociation spectra of gaseous ions
[AD-A264378] p 3821 N93-32032

FRACTALS
Biharmonic pattern selection
[DE93-608186] p 3803 N93-31303
Fractal image coding techniques and contraction operators
[REPT-92-93] p 3789 N93-31632
Fractal coding of monochrome images
[REPT-92-99] p 3790 N93-31656
Desktop chaotic systems: Intuition and visualization
[NASA-TM-106258] p 3808 N93-31847
Estimating the spatial extent of attractors of iterated function systems
[AD-A265856] p 3809 N93-32315

FRACTIONATION
First ionization potential fractionation
p 3878 N93-31411

FRACTOGRAPHY
AGARD Engine Disc Cooperative Test Programme
[AGARD-R-766-ADD] p 3681 N93-31741
Fractographic and microstructural analysis of fatigue crack growth in Ti-6Al-4V fan disc forgings
p 3681 N93-31742
Fractographic investigation of IMI 685 crack propagation specimens for SMP SC33 p 3681 N93-31743
Material characterization and fractographic examination of Ti-17 fatigue crack growth specimens for SMP SC33
p 3681 N93-31744
Conclusions and recommendations
p 3682 N93-31749

FRACTURE MECHANICS
Probabilistic fracture finite elements
p 3695 N93-31571
Overview of the fatigue/fracture/life prediction working group program at the Lewis Research Center
p 3696 N93-31574
NASA-UVA Light Aerospace Alloy and Structures Technology Program (LA2ST)
[NASA-CR-193412] p 3706 N93-31739
Fractographic and microstructural analysis of fatigue crack growth in Ti-6Al-4V fan disc forgings
p 3681 N93-31742
Fractographic investigation of IMI 685 crack propagation specimens for SMP SC33 p 3681 N93-31743
Crack growth prediction results p 3682 N93-31748
Fatigue in single crystal nickel superalloys
[AD-A265451] p 3706 N93-31795
A mechanics model for the compressive response of fiber reinforced composites
[AD-A265556] p 3701 N93-32067
Ceramics models in the MESA codes
[DE93-000683] p 3711 N93-32186
Stress-rupture behavior of small diameter polycrystalline alumina fibers
[NASA-TM-106256] p 3712 N93-32382

FRACTURE STRENGTH
Tetragonal zirconia ceramics in Zr O2-Ce O2 system (CP): Preparation, characterization, and mechanical properties
[DE93-606833] p 3708 N93-31089
Probabilistic fracture finite elements
p 3695 N93-31571
NASA-UVA Light Aerospace Alloy and Structures Technology Program (LA2ST)
[NASA-CR-193412] p 3706 N93-31739
Evaluation of the chevron notch fracture toughness test for brittle materials
[NPL-DMM(A)-72] p 3742 N93-32384

FRANCE
French aerospace equipment p 3883 N93-31734

FREE ELECTRON LASERS
Report of the working group on far field accelerators
[AD-A265443] p 3732 N93-32021

FREE ENERGY
Local order and concentration fluctuations in K-Pb and Rb-Pb alloys
[DE93-606725] p 3704 N93-31093

FREE FLIGHT
Design and implementation of fuzzy logic controllers
[NASA-CR-193268] p 3784 N93-31649

FREE FLOW
The influence of variable flow velocity on unsteady airfoil behavior
[DLR-FB-92-22] p 3672 N93-31320
A continuation method for computing non-linear 3-D free surface flows
[DE93-008704] p 3727 N93-32175

FREE JETS
Streamwise vorticity generation and mixing enhancement in free jets by delta-tabs
[NASA-TM-106235] p 3672 N93-31648

FREE RADICALS
Investigation of laser-induced retinal damage
[AD-A264096] p 3772 N93-31094

FREQUENCIES
Research studies in electromagnetically induced transparency
[AD-A264303] p 3732 N93-31866
Fast Fourier Transform analysis of computer-acquired friction data
[DE93-010337] p 3736 N93-32179

FREQUENCY ANALYZERS
An investigation of dayside FTE's observed by the AMPTE-UKS satellite p 3858 N93-31709

FREQUENCY DISTRIBUTION
Radiative modeling of solar prominences, two-dimensional transfer plus partial frequency redistribution p 3875 N93-31389
Fast Fourier Transform analysis of computer-acquired friction data
[DE93-010337] p 3736 N93-32179

FREQUENCY MODULATION
Advanced infrared spectroscopy for improved characterization of chemical systems
[PB93-174977] p 3703 N93-31875
Auditory spectro-temporal pattern analysis
[AD-A264691] p 3773 N93-31981

FREQUENCY SHIFT KEYING
Trellis coded modulation applied to orthogonal signals
[AD-A265232] p 3717 N93-32060

FRESH WATER
Geochemical, genetic, and physiological control of pollutant biodegradation
[AD-A264106] p 3753 N93-32027

FRICTION
Fast Fourier Transform analysis of computer-acquired friction data
[DE93-010337] p 3736 N93-32179

FRICTION FACTOR
Tribological characteristics of perfluoropolyether liquid lubricants under sliding conditions in high vacuum
[NASA-TM-106257] p 3711 N93-32352

FRICTION REDUCTION
Study of pipe friction reduction materials for gas transportation.
[PB93-189181] p 3724 N93-31438

FRONTS (METEOROLOGY)
U.S. National weather experiment STORM-FEST 1992: Wave and turbulence in frontal zones
[AD-A264294] p 3766 N93-31182
FUEL CELL POWER PLANTS
Eleventh Annual Conference on Energy Conservation and Storage Technologies
[DE93-768429] p 3748 N93-32038
FUEL CELLS
New alternative for electricity production. Part 3: Electricity production from biomass and natural gas by a solid oxide fuel cell
[VTT-TIED-1397] p 3720 N93-31862
Advanced alternate planar geometry solid oxide fuel cells
[DE93-000248] p 3721 N93-32174
FUEL CONSUMPTION
Survey on global environmental effects of petroleum substitution energy utilization
[DE93-768475] p 3754 N93-32040
A parametric analysis of endoatmospheric Low-Earth-Orbit maintenance
[AD-A265868] p 3685 N93-32319
FUEL INJECTION
Spray characteristics of two types of fuel injectors
[PB93-180859] p 3736 N93-32069
Analytical and experimental investigations of the oblique detonation wave engine concept
[NASA-TM-102839] p 3683 N93-32374
FUEL PRODUCTION
New directions for the catalytic conversion of methane
[PB93-188795] p 3702 N93-31435
FUEL PUMPS
Three-dimensional analysis of the Pratt and Whitney alternate design SSME fuel turbine
p 3697 N93-31584
FUEL SPRAYS
Spray characteristics of two types of fuel injectors
[PB93-180859] p 3736 N93-32069
FULLERENES
A high thrust density, C60 cluster, ion thruster
[AD-A264405] p 3691 N93-31188
Cyclocarbon coalescence: Mechanisms for tailormade fullerene formation
[AD-A265489] p 3821 N93-31995
FUNCTION SPACE
Approximation orders of and approximation maps from local principal shift-invariant spaces
[AD-A265038] p 3808 N93-31999
FUNCTIONAL DESIGN SPECIFICATIONS
Z through pictures
[RSRE-MEMO-4587] p 3787 N93-31337
ARIES: Acquisition of Requirements and Incremental Evolution of Specifications p 3794 N93-32157
Noise from high speed maglev systems: Noise sources, noise criteria, preliminary design guidelines for noise control, and recommendations for acoustical test facility for maglev research
[PB93-154896] p 3736 N93-32193
Enhanced methods for determining operational capabilities and support costs of proposed space systems
[NASA-CR-193265] p 3812 N93-32350
FUSION REACTORS
Inertial electrostatic confinement as a power source for electric propulsion
[NASA-TM-109228] p 3692 N93-31310
FUZZY SETS
Introduction to Fuzzy Set Theory
p 3689 N93-31446
Modeling users' behavior and threats for security
[REPT-92-071] p 3811 N93-31476
Design and implementation of fuzzy logic controllers
[NASA-CR-193268] p 3784 N93-31649
Real-time qualitative reasoning for telerobotic systems
p 3737 N93-32116
FUZZY SYSTEMS
Workshop on Fuzzy Control Systems and Space Station Applications
[NASA-CR-193202] p 3688 N93-31439
Fuzzy Control/Space Station automation
p 3688 N93-31440
Commercial applications p 3688 N93-31441
Current projects in Fuzzy Control
p 3688 N93-31442
Terminology and concepts of control and Fuzzy Logic
p 3688 N93-31443
NASA/ARC proposed training in intelligent control
p 3688 N93-31444
Overview of Fuzzy Logic p 3688 N93-31445
Introduction to Fuzzy Set Theory
p 3689 N93-31446
Blowdown thrust profile prediction
p 3689 N93-31448
Rendezvous guidance p 3689 N93-31450
Path planning control p 3685 N93-31451
Active damping in a flexible manipulator
p 3689 N93-31452
Hyperbaric treatment p 3689 N93-31454
Daily exercise routines p 3689 N93-31455
Atmospheric control systems p 3689 N93-31456
Rotational speed control p 3689 N93-31457
Vibration isolation p 3690 N93-31458
Design and implementation of fuzzy logic controllers
[NASA-CR-193268] p 3784 N93-31649
Fuzzy based attitude controller for flexible spacecraft with on/off thrusters
[NASA-CR-188250] p 3690 N93-32228

G

GALAXIES
Atomic and molecular line observations of galaxies
p 3847 N93-31771
Using machine learning techniques to automate sky survey catalog generation p 3843 N93-32143
GALERKIN METHOD
Galerkin coarse grid approximation in multigrid for the incompressible Navier-Stokes equations
[REPT-92-103] p 3726 N93-31658
GALLIUM ARSENIDES
Light-induced band-structure modifications in modulation-doped 3-5 semiconductor heterostructures
[ETN-93-94053] p 3828 N93-31619
Carrier capture in 3-5 semiconductor quantum wells
[ETN-93-94054] p 3828 N93-31620
Optoelectronic Materials Center: A collaborative program including University of New Mexico, Stanford University and California Institute of Technology
[AD-A265575] p 3732 N93-32052
Numerical studies of low temperature gallium arsenide buffer layers and their influence on device operation
[AD-A264296] p 3829 N93-32083
GALLIUM NITRIDES
Improved gallium nitride and aluminum nitride electronic materials
[AD-A264570] p 3710 N93-32010
GAMMA RAY ASTRONOMY
The application of two-dimensional imaging to very high energy gamma ray astronomy
[DE93-012326] p 3851 N93-32160
GAMMA RAY TELESCOPES
The application of two-dimensional imaging to very high energy gamma ray astronomy
[DE93-012326] p 3851 N93-32160
GAMMA RAYS
Mathematical simulation of the induced gamma-radiation in structural materials of spaceships
[DE93-606751] p 3688 N93-31076
Characterisation of a protection level Am-241 calibration source
[NPL-RSA(EXT)-35] p 3819 N93-31335
GAS ANALYSIS
Two-stage gas measurement system
[NASA-CASE-LAR-14791-1] p 3729 N93-31297
GAS COMPOSITION
Two-stage gas measurement system
[NASA-CASE-LAR-14791-1] p 3729 N93-31297
GAS DISCHARGES
Potential distributions at gas evolving electrodes
[DLR-FB-92-20] p 3702 N93-31319
GAS DYNAMICS
Contribution to the theoretical study and finite-element approximation of the multidimensional, multispecies, hyperbolic system of gas dynamics
[ESA-TT-1275] p 3724 N93-31429
GAS EXPANSION
An experimental study of under-expanded jets
[OUEL-1959/92] p 3722 N93-31124
GAS INJECTION
In-situ bioventing: Two US EPA and Air Force sponsored field studies
[PB93-194231] p 3754 N93-32089
The PIT MkV pulsed inductive thruster
[NASA-CR-191155] p 3698 N93-32353
GAS JETS
Study of wall heat transfer from a high temperature dissociated hydrogen impinging jet
[DE92-017845] p 3698 N93-32184
GAS MIXTURES
Thermodynamic analysis of processes proceeding on (111) faces of diamond during chemical vapour deposition
[DE93-609039] p 3708 N93-31177
Simple and accurate method for calculating viscosity of gaseous mixtures
[PB93-189751] p 3702 N93-31198
Application of the SAHA equation to high temperature (greater than or equal to 6000 K) rocket exhaust
[AD-A264004] p 3692 N93-31291
Two new gas standards programs at the National Institute of Standards and Technology
[PB93-191427] p 3751 N93-31816
GAS PIPES
GRI proceedings on the Workshop on Plastic Pipe Research Results
[PB93-190460] p 3708 N93-31211
Long-term reliability of gas pipeline repairs by reinforced composites. Annual report, July 1991-June 1992
[PB93-188647] p 3700 N93-31334
GAS PRESSURE
Rayleigh-Brillouin scattering for high-pressure gas temperature measurements p 3693 N93-31556
GAS TEMPERATURE
Rayleigh-Brillouin scattering for high-pressure gas temperature measurements p 3693 N93-31556
Advanced infrared spectroscopy for improved characterization of chemical systems
[PB93-174977] p 3703 N93-31875
GAS TUNGSTEN ARC WELDING
Understanding heat and fluid flow in linear GTA welds
[DE93-012958] p 3727 N93-32303
GAS TURBINE ENGINES
Fatigue in single crystal nickel superalloys
[AD-A265451] p 3706 N93-31795
Propulsion technology challenges for turn-of-the-century commercial aircraft
[NASA-TM-106192] p 3682 N93-32351
GAS VISCOSITY
Simple and accurate method for calculating viscosity of gaseous mixtures
[PB93-189751] p 3702 N93-31198
GAS-SOLID INTERACTIONS
Fundamental studies of new high-energy permanent magnet materials
[DE93-014707] p 3815 N93-32291
GASEOUS FUELS
Novel strategies for the synthesis of methane adsorbents with controlled porosity and high surface area
[PB93-189967] p 3702 N93-31209
GASOLINE
Making clean gasoline: The effect on jet fuels
[AD-A264302] p 3713 N93-32085
GAUGE INVARIANCE
String-like excitations in quantum electrodynamics
[DE92-642593] p 3830 N93-31075
Intuitive approach to modified gyrokinetic equation and numerical confirmation
[DE93-604671] p 3812 N93-31083
GAUGE THEORY
String-like excitations in quantum electrodynamics
[DE92-642593] p 3830 N93-31075
A note on the Dirac canonical quantization of massive Yang-Mills theory
[DE93-608199] p 3813 N93-31460
GEARS
Efficient fault diagnosis of helicopter gearboxes
[NASA-TM-106253] p 3735 N93-31846
GELS
Novel strategies for the synthesis of methane adsorbents with controlled porosity and high surface area
[PB93-189967] p 3702 N93-31209
GENERAL AVIATION AIRCRAFT
Reaction to aircraft noise near general aviation airfields
[DORA-8203] p 3817 N93-32377
GENES
Genetic algorithms for DNA sequence assembly
[DE93-012708] p 3792 N93-32299
GENETIC ALGORITHMS
Genetic algorithms for DNA sequence assembly
[DE93-012708] p 3792 N93-32299
Introduction to natural algorithms
[REPT-92-058] p 3793 N93-32391
GENETICS
Geochemical, genetic, and physiological control of pollutant biodegradation
[AD-A264106] p 3753 N93-32027
GEOCHEMISTRY
Effects of low-level radioactive-waste disposal on water chemistry in the unsaturated zone at a site near Sheffield, Illinois, 1982-1984
[PB93-183051] p 3752 N93-31829
Macrofossil records of West Antarctic Ice Sheet retreat during the Holocene p 3759 N93-31881
MSATT Workshop on Chemical Weathering on Mars
[NASA-CR-193209] p 3861 N93-31933
Aqueous geochemistry on Mars: Possible clues from salts and clays in SNC meteorites p 3863 N93-31944
Chemical modeling constraints on Martian surface mineralogies formed in an early, warm, wet climate, and speculations on the occurrence of phosphate minerals in the Martian regolith p 3865 N93-31956

Infrared optical properties of Mars soil analog materials: Palagonites p 3866 N93-31957
The Martian ocean: First acid, then alkaline p 3866 N93-31958
Experimental investigation of carbonate formation on Mars p 3866 N93-31959
Geochemistry and setting of Martian weathering: The Lafayette meteorite p 3866 N93-31961
Geochemical, genetic, and physiological control of pollutant biodegradation
[AD-A264106] p 3753 N93-32027

GEOCHRONOLOGY
Lithology and chronology of ice-sheet fluctuations (magnetic susceptibility of cores from the western Ross Sea) p 3759 N93-31880
The diatom record from beneath the West Antarctic Ice Sheet and the global proxy perspective p 3759 N93-31882

GEODESY
Radiointerferometric observations for estimation of pole motion by using long north-south reference axes
[SER-C-368] p 3746 N93-31339
Changes on the ice plain of Ice Stream B and Ross Ice Shelf p 3760 N93-31889

GEODETIC COORDINATES
Experiences with two GPS receivers in northern Europe
[NLR-TP-91168-U] p 3675 N93-31120
Differential small displacements and rotation extensions in three dimensional coordinate systems
[SER-B-295] p 3804 N93-31338

GEOGRAPHIC INFORMATION SYSTEMS
Spatial relational algebra: An extended relational algebra for spatial database
[REPT-92-051] p 3786 N93-31249
European Road Database: Activities within the ATKIS p 3744 N93-31257
Satellite pictures: An efficient aid for information about land use
[ETN-93-93467] p 3747 N93-32343

GEOLOGICAL FAULTS
Geologic controls on the West Antarctic Ice Sheet p 3762 N93-31900

GEOLOGICAL SURVEYS
Reconnaissance and deep-drill site selection on Taylor Dome, Antarctica p 3759 N93-31883
Land subsidence and problems affecting land use at Edwards Air Force Base and vicinity, California, 1990
[PB93-182236] p 3765 N93-32191

GEOLOGY
Numerical methods for inverse problems in three-dimensional geophysical modeling, phase 2
[PB93-181584] p 3758 N93-31872
Proceedings of the First Geological Materials Constitutive Modeling Workshop
[DE93-009161] p 3765 N93-32176

GEOMAGNETIC LATITUDE
The effects of magnetic storm phases on F-layer irregularities from auroral to equatorial latitudes
[AD-A264908] p 3764 N93-32094

GEOMAGNETIC PULSATIONS
Ionospheric control of the long-term occurrence of Pc1 pulsations observed on ground p 3860 N93-31722

GEOMAGNETISM
Detecting and tracking changes in solar wind conditions using interplanetary scintillation p 3857 N93-31703

GEOMETRIC ACCURACY
Performance of scanline-oriented CSG direct display algorithms
[REPT-93-03] p 3788 N93-31548

GEOMORPHOLOGY
Weathering processes implied from analysis of small Martian avalanche chutes p 3866 N93-31960

GEOPHYSICS
Solar-geophysical data number 583, March 1993. Part 1: (Prompt reports). Data for February, January 1993, and late data
[PB93-188894] p 3881 N93-31436
Solar-geophysical data number 583, March 1993. Part 2: (Comprehensive reports). Data for September 1992 and miscellaneous
[PB93-188902] p 3881 N93-31437
Numerical methods for inverse problems in three-dimensional geophysical modeling, phase 2
[PB93-181584] p 3758 N93-31872
The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop
[NASA-CP-3222] p 3758 N93-31878
Airborne gravity and other geophysical techniques for understanding the lithosphere beneath the West Antarctic Ice Sheet p 3761 N93-31894

GEOSYNCHRONOUS ORBITS
Diagnostics of magnetic substorms using satellite observations of magnetic pulsations
[AD-A264300] p 3764 N93-32084

GEOTHERMAL ENERGY CONVERSION
Japan's Sunshine Project
[DE93-768268] p 3749 N93-32054

GEOTHERMAL ENERGY EXTRACTION
Japan's Sunshine Project
[DE93-768249] p 3749 N93-32053

GEOTHERMAL ENERGY UTILIZATION
Japan's Sunshine Project
[DE93-768249] p 3749 N93-32053
Japan's Sunshine Project
[DE93-768268] p 3749 N93-32054

GEOTHERMAL RESOURCES
Japan's Sunshine Project
[DE93-768249] p 3749 N93-32053
Japan's Sunshine Project
[DE93-768268] p 3749 N93-32054

GEOTHERMAL TECHNOLOGY
Japan's Sunshine Project
[DE93-768249] p 3749 N93-32053
Japan's Sunshine Project
[DE93-768268] p 3749 N93-32054

GERMAN SPACE PROGRAM
Technology transfer: Potential of BMFT concept for hypersonics
[MBB-LME-202-S-PUB-0505] p 3843 N93-31045

GET AWAY SPECIALS (STS)
Hitchhiker: Customer Accommodations and Requirements Specifications (CARS)
[NASA-TM-109225] p 3834 N93-31644

GLACIAL DRIFT
The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop
[NASA-CP-3222] p 3758 N93-31878
The diatom record from beneath the West Antarctic Ice Sheet and the global proxy perspective p 3759 N93-31882

GLACIERS
The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop
[NASA-CP-3222] p 3758 N93-31878
Macrofossil records of West Antarctic Ice Sheet retreat during the Holocene p 3759 N93-31881
The diatom record from beneath the West Antarctic Ice Sheet and the global proxy perspective p 3759 N93-31882
Irregular oscillations of the West Antarctic Ice Sheet p 3759 N93-31884
Velocities of Thwaites and Land glaciers p 3760 N93-31885
The mass balance of the ice plain of Ice Stream B and Crary Ice Rise p 3760 N93-31888
Changes on the ice plain of Ice Stream B and Ross Ice Shelf p 3760 N93-31889
Surface velocity fields of Ice Streams D and E derived from repeat satellite imagery p 3760 N93-31890
Recent acceleration of Thwaites Glacier p 3761 N93-31893
Basal hydraulic conditions of Ice Stream B p 3762 N93-31898
Geologic controls on the West Antarctic Ice Sheet p 3762 N93-31900
Effect of subglacial volcanism on changes in the West Antarctic Ice Sheet p 3762 N93-31901
Surface winds over West Antarctica p 3763 N93-31903
Modeling ice streams: Derived quantities p 3763 N93-31904
Chemical transport during formation and alteration of Martian impact and volcanic deposits p 3865 N93-31953

GLACIOLOGY
The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop
[NASA-CP-3222] p 3758 N93-31878
The diatom record from beneath the West Antarctic Ice Sheet and the global proxy perspective p 3759 N93-31882
Condition of the Ross Ice Shelf derived from AVHRR imagery p 3760 N93-31886
SPOT satellite mapping of Ice Stream B p 3760 N93-31887
The mass balance of the ice plain of Ice Stream B and Crary Ice Rise p 3760 N93-31888
Airborne gravity and other geophysical techniques for understanding the lithosphere beneath the West Antarctic Ice Sheet p 3761 N93-31894

GLASS
SiC fiber-reinforced Celsian glass-ceramic matrix composite
[NASA-CASE-LEW-15264-1] p 3700 N93-31293
Method of producing a ceramic fiber-reinforced glass-ceramic matrix composite
[NASA-CASE-LEW-15264-2] p 3700 N93-31299
Preliminary results of an experimental study of the interactions of basalt glass and a water vapor atmosphere: Implications for weathering on Mars p 3864 N93-31948
Reflectance spectroscopy and GEX simulation of palagonite and iron-rich montmorillonite clay mixtures: Implications for the surface composition of Mars p 3865 N93-31954
Infrared optical properties of Mars soil analog materials: Palagonites p 3866 N93-31957
Affecting factors to the electrical properties of RuO2 thick-film resistors
[DE93-768332] p 3721 N93-32055

GLASS FIBER REINFORCED PLASTICS
Long-term reliability of gas pipeline repairs by reinforced composites. Annual report, July 1991-June 1992
[PB93-188647] p 3700 N93-31334

GLASS FIBERS
Development of technical processes for manufacturing heavy metal fluoride glass fibers
[ETN-93-94200] p 3707 N93-31047
High cycle fatigue of glass fibre reinforced epoxy materials for wind turbines
[DLR-FB-92-17] p 3700 N93-31461

GLIDERS
Effects of an aft facing step on the surface of a laminar flow glider wing
[NASA-CR-193302] p 3673 N93-31855

GLOBAL POSITIONING SYSTEM
Experiences with two GPS receivers in northern Europe
[NLR-TP-91168-U] p 3675 N93-31120
Mass balance assessment using GPS p 3761 N93-31892
Airborne gravity and other geophysical techniques for understanding the lithosphere beneath the West Antarctic Ice Sheet p 3761 N93-31894
The application of phase tracking GPS for flight test trajectory determination
[NLR-TP-91349-U] p 3678 N93-32337

GLOBAL WARMING
Irregular oscillations of the West Antarctic Ice Sheet p 3759 N93-31884

GLUCOSE
Idiopathic Reactive Hypoglycemia in a population of healthy trainees of an Italian Air Force military school p 3779 N93-32248

GLUONS
Novel spin effects in quantum chromodynamics
[DE93-010955] p 3833 N93-32181

GOES SATELLITES
Coronal mass ejecta and flares: A statistical study p 3859 N93-31716

GOVERNMENT/INDUSTRY RELATIONS
States and small business: A directory of programs and activities, 1993 edition
[PB93-186427] p 3834 N93-31433

GOVERNMENTS
The Impact of Changing International Relations on the Scientific and Technical Community
[AGARD-CP-523] p 3836 N93-31215

GRADIENTS
Metastability in molecules
[AD-A264344] p 3817 N93-31063

GRAMMARS
A formal discourse grammar tackling verb phrase anaphora
[CL-91-03] p 3787 N93-31478

GRAPH THEORY
A generalized asymptoticity problem in max algebra, the general case
[REPT-92-76] p 3804 N93-31471
Disturbance decoupling by measurement feedback for structured systems: A graph theoretical approach
[REPT-92-53] p 3805 N93-31487
Graph theoretic methods for the computation of disturbance decoupling feedback matrices for structured systems
[REPT-92-54] p 3789 N93-31614
Cycles in tough graphs: Updating the last four years
[MEMO-1091] p 3810 N93-32398
Smallest regular graphs with given diameter
[MEMO-1092] p 3810 N93-32399
A note on dominating cycles in 2-connected graphs
[MEMO-1094] p 3810 N93-32401

GRAPHICAL USER INTERFACE
Assessment of a human computer interface prototyping environment
[NASA-CR-192612] p 3784 N93-31849
Automatic specification of reliability models for fault-tolerant computers
[NASA-TP-3301] p 3812 N93-31869

GRAPHITE
Investigation of carbon near the graphite-diamond-liquid triple point
[DE93-609052] p 3708 N93-31178

GRAPHITE-EPOXY COMPOSITES
Measurement of the out-of-plane shear response of thick section composite materials using the v-notched beam specimen
[AD-A264898] p 3699 N93-31065
GRAPHITIZATION
Method for producing hybrid graphite composite
[NASA-CASE-LEW-15241-2] p 3700 N93-31296
GRAPHS (CHARTS)
An extended algorithm for performance evaluation of timed event graphs
[REPT-92-75] p 3787 N93-31474
Cycles in tough graphs: Updating the last four years
[MEMO-1091] p 3810 N93-32398
Smallest regular graphs with given diameter
[MEMO-1092] p 3810 N93-32399
A note on dominating cycles in 2-connected graphs
[MEMO-1094] p 3810 N93-32401
GRATINGS (SPECTRA)
A design for a visual motion transducer
[OUEL-1960/92] p 3785 N93-31054
GRAVITATION
2 + 1 gravity without dynamics
[DE92-642587] p 3757 N93-31081
Gravitation of global topological defects
p 3757 N93-31130
BRST cohomology ring in 2D gravity coupled to minimal models
[DE93-608192] p 3757 N93-31305
GRAVITATIONAL COLLAPSE
Constraints on cosmic strings due to black holes formed from collapsed cosmic string loops
[NASA-CR-193248] p 3861 N93-31837
GRAVITATIONAL FIELDS
Ashtekar variables, self-dual metrics, and w(infinity)
[DE92-642588] p 3802 N93-31074
Study of the second-order relativistic light deflection of the Sun using long-baseline fibre-linked interferometers: Laser-Interferometric Solar Relativity (LISOR) test
p 3849 N93-31778
A universal mass in (2+1)-dimensions
[DE93-609888] p 3832 N93-31911
GRAVITY WAVES
Orographically forced internal-wave instability
[ISBN-0-315-73891-X] p 3757 N93-31106
Eddy vortices produced by nonlinear reflection of a gravity wave at a critical level p 3757 N93-31155
U.S. National weather experiment STORM-FEST 1992: Wave and turbulence in frontal zones
[AD-A264294] p 3766 N93-31182
GREEN'S FUNCTIONS
Determination of the electrostatic Green's function for stratified media
[REPT-92-067] p 3716 N93-31607
Numerical analysis of the spectral domain of transmission lines in dielectric layers
[REPT-92-068] p 3716 N93-31608
Characteristics and properties of the continuity equations in a semiconductor
[REPT-92-080] p 3720 N93-31609
GREENHOUSE EFFECT
Central Africa: Global climate change and development
[PB93-179612] p 3768 N93-31871
GRID GENERATION (MATHEMATICS)
The ViB-code to simulate 3-D stator/rotor flow in axial turbines
[DLR-FB-92-19] p 3681 N93-31170
GROUND CREWS
Lipidemic profile of Hellenic Airforce officers
p 3774 N93-32250
The X-15/HL-20 operations support comparison
[NASA-TM-4453] p 3687 N93-32379
GROUND OPERATIONAL SUPPORT SYSTEM
Ground Robotic Hand Applications for the Space Program study (GRASP)
[NASA-CR-193571] p 3737 N93-32235
The X-15/HL-20 operations support comparison
[NASA-TM-4453] p 3687 N93-32379
GROUND STATE
The three-body problem in the ground-state representation
[DE93-608164] p 3803 N93-31289
GROUND TESTS
Flight test of avionic and air-traffic control systems
[ESA-TT-1279] p 3675 N93-31271
Ground installations for preparation and evaluation of flight tests p 3675 N93-31274
GROUND WATER
Preferential flow effects on chemical transport and retardation in soils
[PB93-190668] p 3723 N93-31204
Effects of low-level radioactive-waste disposal on water chemistry in the unsaturated zone at a site near Sheffield, Illinois, 1982-1984
[PB93-183051] p 3752 N93-31829
Calculated mineral precipitation upon evaporation of a model Martian groundwater near 0 C
p 3862 N93-31940
Statistical and numerical methods in control and identification
[AD-A264676] p 3811 N93-32016
Geochemical, genetic, and physiological control of pollutant biodegradation
[AD-A264106] p 3753 N93-32027
GROUND WIND
Surface winds over West Antarctica
p 3763 N93-31903
GROUND-AIR-GROUND COMMUNICATION
Testing concept of a taxiing control system, summary
p 3676 N93-31278
GROUP THEORY
BRST cohomology ring in 2D gravity coupled to minimal models
[DE93-608192] p 3757 N93-31305
Most monothetic extensions are rank-1
[REPT-93-05] p 3813 N93-31546
Perturbation of the Laplacian by the Coulomb potential and a point interaction in L(sup p)(R cubed)
[REPT-92-55] p 3807 N93-31613
Three lectures on quantum groups: Representations, duality, real forms
[DE93-608159] p 3832 N93-31807
GULF STREAM
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 3: Appendices
[PB93-186088] p 3771 N93-32308
GULFS
Variability of temperature and salinity in the Middle Atlantic Bight and Gulf of Maine
[PB93-174019] p 3769 N93-31591
Tides of Massachusetts and Cape Cod Bays
[AD-A264790] p 3770 N93-31983
GUN PROPELLANTS
A summary of the JANNAF Workshop on Methods for Exchange of Gun Propellant Burning Rate Information
[AD-A264113] p 3713 N93-32030
GYROSCOPES
Evaluation of a solid-state gyroscope for robotics applications
[OUEL-1957/92] p 3728 N93-31125

H

H ALPHA LINE
Coronagraphic ground based support for SOHO at the Pic-du-Midi Observatory (France) p 3880 N93-31420
Automatic recognition of solar features
p 3880 N93-31421
P Cyg envelope and prospects of interferometric observations p 3848 N93-31777
H I REGIONS
Study of ISM turbulence using radiointerferometers (new method) p 3847 N93-31767
H-INFINITY CONTROL
Optimal solutions to a two-block H infinity problem
[MEMO-1080] p 3798 N93-31468
H infinity-control with measurement-feedback for Pritchard-Salamon system
[W-9211] p 3799 N93-31628
HABITS
The lifestyle and dietary consumption patterns of United States Air Force aviators within air training command at Randolph Air Force Base, Texas p 3780 N93-32257
HABITUATION (LEARNING)
Background and objectives of the PARAT program
p 3775 N93-31230
The PARAT tests as examination system
p 3776 N93-31238
HADRONS
Pion multiplicity as a probe of the deconfinement transition in heavy-ion collisions
[DE93-608484] p 3817 N93-31059
Two jet production in hadron collisions at order alpha(sub s)(sup 3) in QCD
[DE93-010563] p 3822 N93-32159
HALL EFFECT
The constraint for the lowest Landau level and the effective field theory approach for the fractional quantum hall system
[DE93-608200] p 3831 N93-31509
HAMILTONIAN FUNCTIONS
Ashtekar variables, self-dual metrics, and w(infinity)
[DE92-642588] p 3802 N93-31074
2 + 1 gravity without dynamics
[DE92-642587] p 3757 N93-31081
Numerical evidence for two types of localized states in a two-dimensional disordered lattice
[DE92-642677] p 3827 N93-31159
Microscopic origin of marginal Fermi-liquid in strongly correlated spin systems
[DE93-608697] p 3827 N93-31163
Calculations of wavefunctions and energies of electron system in Coulomb potential by variational method without a basis set
[DE93-608161] p 3819 N93-31286
Information-theoretic outlook of the quantum dissipation problem
[DE93-608162] p 3831 N93-31287
Information-theoretic and Wigner function approaches to the nonclassical states dynamics for the variable frequency harmonic oscillator
[DE93-608166] p 3813 N93-31301
A note on the Dirac canonical quantization of massive Yang-Mills theory
[DE93-608199] p 3813 N93-31460
A normally elliptic Hamiltonian bifurcation
[W-9214] p 3807 N93-31623
The Lipkin model second order phase transition in the deformed su(2) algebra description
[DE93-608201] p 3807 N93-31661
Excitonic bistabilities, instabilities and chaos in laser-pumped semiconductor
[DE93-608677] p 3731 N93-31669
Supersymmetric construction of W-algebras from super Toda and WZNW theories
[DE93-608244] p 3808 N93-31819
Hamiltonian moments and the Lanczos method in the Heisenberg model
[DE93-609845] p 3813 N93-31905
Plaquette expansion in lattice Hamiltonian models
[DE93-609846] p 3813 N93-31906
On two-current realization of KP hierarchy
[DE93-609917] p 3808 N93-31912
Random walks and a simple chirally invariant lattice Hamiltonian without fermion doubling
[DE93-609920] p 3821 N93-31913
A note on dominating cycles in 2-connected graphs
[MEMO-1094] p 3810 N93-32401
HAND (ANATOMY)
Prevention of cumulative trauma disorders
[PB93-188332] p 3773 N93-31138
HANDBOOKS
Composites design handbook: Update
[ESA-PSS-03-1101-ISSUE-1-RE] p 3701 N93-31740
Standard Reference Materials: Handbook for SRM users
[PB93-183796] p 3699 N93-31830
HARDNESS
Tetragonal zirconia ceramics in Zr O2-Ce O2 system (CP): Preparation, characterization, and mechanical properties
[DE93-606833] p 3708 N93-31089
HARDWARE
Co-ordinated data handling for the UK participants in the Cluster mission p 3843 N93-31713
HARMONIC EXCITATION
Dynamic response of a transducer mounted at one end of an acoustical cavity
[DE93-012837] p 3816 N93-32301
HARMONIC GENERATIONS
Cerenkov type phase-matched second harmonic generation in polymeric channel waveguides
[AD-A265787] p 3710 N93-31801
HARMONIC OSCILLATORS
Information-theoretic outlook of the quantum dissipation problem
[DE93-608162] p 3831 N93-31287
Information-theoretic and Wigner function approaches to the nonclassical states dynamics for the variable frequency harmonic oscillator
[DE93-608166] p 3813 N93-31301
Geometric model from microscopic theory for nuclear absorption
[NASA-TP-3324] p 3822 N93-32369
HARTREE APPROXIMATION
Metastability in molecules
[AD-A264344] p 3817 N93-31063
HAZARDS
Maglev guideway and route integrity requirements
[PB93-154870] p 3736 N93-32086
Micromachined chemical sensor with integrated microelectronics
[DE93-013761] p 3730 N93-32306
HAZE
The NPL reference hazemeter
[NPL-QU-94] p 3729 N93-31325
HEAD MOVEMENT
Transmission of vibration through the human body to the head: A summary of experimental data
[ISVR-TR-218] p 3774 N93-32237
HEART DISEASES
Correlation of life-style and dietary concomitants of Greek pilots with serum analytes p 3780 N93-32256

HEART RATE
Portable equipment developed to estimate energy expenditure by simultaneous recording of heart rate and body position p 3778 N93-32243
HEAT AFFECTED ZONE
Deformation analysis of welded joints
[ETN-93-94199] p 3739 N93-31057
HEAT BALANCE
Thermal control of ice-stream margins
p 3762 N93-31897
HEAT ENGINES
Experiments on a general thermoacoustic engine
[AD-A265864] p 3817 N93-32317
HEAT EXCHANGERS
Enhancement of single phase forced convection heat transfer in tubes and ducts using tangential flow injection
[PB93-189975] p 3723 N93-31210
Experiments on a general thermoacoustic engine
[AD-A265864] p 3817 N93-32317
HEAT FLUX
Progress in the measurement of SSME turbine heat flux with plug-type sensors p 3692 N93-31553
Thin film heat flux sensor for Space Shuttle Main Engine turbine environment p 3693 N93-31554
Thin film thermocouples for high temperature turbine application p 3693 N93-31555
Heat transfer and pressure measurements for the SSME fuel turbine p 3698 N93-31587
A scintillation experiment over a forest
[KNMI-WR-92-04] p 3746 N93-31595
Hypersonic engine component experiments in high heat flux, supersonic flow environment
[NASA-TM-106273] p 3726 N93-31860
Aerogeophysical evidence for active volcanism beneath the West Antarctic Ice Sheet p 3761 N93-31895
Sensible and latent heat flux estimates in Antarctica
p 3763 N93-31902
Non-contact heat flux measurement using a transparent sensor
[NASA-TM-106252] p 3713 N93-32330
HEAT MEASUREMENT
Progress in the measurement of SSME turbine heat flux with plug-type sensors p 3692 N93-31553
Thin film heat flux sensor for Space Shuttle Main Engine turbine environment p 3693 N93-31554
Thin film thermocouples for high temperature turbine application p 3693 N93-31555
EXAM: A two-state thermodynamic analysis program
[PB93-191658] p 3703 N93-31817
Structural characterization of nylon 7 by solid-state NMR, DSC, and ATR-FTIR
[AD-A265800] p 3822 N93-32312
Synthesis and characterization of copolymers of nylon 11 and nylon 12
[AD-A265841] p 3711 N93-32314
HEAT PUMPS
International Energy Agency's Heat Pump Centre (IEA-HPC) Annual National Team Working Group Meeting
[DE93-009932] p 3750 N93-32281
HEAT RESISTANT ALLOYS
Oxidation resistant overlay coatings for low expansion substrates
[NASA-CASE-LEW-15154-2] p 3708 N93-31300
Cumulative fatigue damage behavior of MAR M-247
p 3696 N93-31575
The effect of porosity and gamma-gamma' eutectic content on the low cycle fatigue behavior of hydrogen-charged PWA-1480 p 3696 N93-31576
Secondary orientation effects in a single crystal superalloy under mechanical and thermal loads
p 3696 N93-31578
An investigation of squeeze-cast alloy 718
[NASA-TM-108412] p 3706 N93-31646
Fatigue in single crystal nickel superalloys
[AD-A265451] p 3706 N93-31795
HEAT SOURCES
Thulium heat sources for space power application
[DE93-002249] p 3691 N93-31168
Study survey on a high-efficiency environment harmony type energy cascade utilization system
[DE93-768469] p 3748 N93-31812
HEAT TRANSFER
F2D: A two-dimensional compressible gas flow code
[DE93-003239] p 3723 N93-31169
Thermal conductivities of slags
[NPL-DMM(A)-68] p 3705 N93-31322
Heat transfer measurements using infra-red thermography in rarefied flows
[RAE-TM-W-1] p 3724 N93-31336
Parametric studies of shock wave/boundary layer interactions over 2D compression corners at Mach 6
[VKI-TN-181] p 3672 N93-31538
Overview of aerothermodynamic loads definition study
p 3697 N93-31583
Heat transfer and pressure measurements for the SSME fuel turbine p 3698 N93-31587
Analysis of effective thermal conductivity of fibrous materials
[NASA-CR-193242] p 3709 N93-31636
Measurements and computational analysis of heat transfer and flow in a simulated turbine blade internal cooling passage
[NASA-TM-106189] p 3725 N93-31647
Study of wall heat transfer from a high temperature dissociated hydrogen impinging jet
[DE92-017845] p 3698 N93-32184
Understanding heat and fluid flow in linear GTA welds
[DE93-012958] p 3727 N93-32303
HEAT TRANSFER COEFFICIENTS
Measurements and computational analysis of heat transfer and flow in a simulated turbine blade internal cooling passage
[NASA-TM-106189] p 3725 N93-31647
HEAT TRANSMISSION
Overview of aerothermodynamic loads definition study
p 3697 N93-31583
Thermal control of ice-stream margins
p 3762 N93-31897
Understanding heat and fluid flow in linear GTA welds
[DE93-012958] p 3727 N93-32303
HEAT TREATMENT
Fractographic investigation of IMI 685 crack propagation specimens for SMP SC33 p 3681 N93-31743
HEATING
A comparison of the dynamical signatures of coronal heating mechanisms p 3875 N93-31394
Observational tests of coronal heating models
p 3877 N93-31403
HEAVY IONS
Pion multiplicity as a probe of the deconfinement transition in heavy-ion collisions
[DE93-608484] p 3817 N93-31059
Solar wind heavy ions and proton/alpha particle relations observed onboard the Prognoz 7 satellite
p 3879 N93-31414
Nuclear structure effects in elastic and inelastic scattering of light ions
[DE93-616909] p 3822 N93-32407
HEAVY NUCLEI
Geometric model from microscopic theory for nuclear absorption
[NASA-TP-3324] p 3822 N93-32369
HELICOPTER CONTROL
Development and flight testing of a fault-tolerant fly-by-light yaw control system p 3676 N93-31280
Current projects in Fuzzy Control
p 3688 N93-31442
HELICOPTERS
Operation of the helicopter antenna radiation prediction code
[NASA-CR-193259] p 3715 N93-31110
The DLR test aircraft in the FZ-BS, -VFW 614/ATTAS, Dornier DO 228-101, MBB BO105 S-3
p 3675 N93-31272
Pallet for helicopter test instrumentation
p 3676 N93-31279
Efficient fault diagnosis of helicopter gearboxes
[NASA-TM-106253] p 3735 N93-31846
Application and validation of workload assessment techniques
[AD-A264575] p 3777 N93-32012
Flight evaluation of a computer aided low-altitude helicopter flight guidance system
[NASA-TM-103998] p 3678 N93-32225
HELIOS 1
Influence of interplanetary shocks on approximately 10 MeV protons: A phenomenological classification
p 3854 N93-31686
HELIOS 2
Influence of interplanetary shocks on approximately 10 MeV protons: A phenomenological classification
p 3854 N93-31686
HELIOSPHERE
Heliospheric current sheet effects on the propagation of solar-generated shock waves p 3854 N93-31685
Origin of the solar wind and coronal mass ejections
p 3856 N93-31702
HELIUM
Frequency of the chemical elements in B-stars of the local field and dispersion of interstellar medium
[ETN-93-94205] p 3852 N93-31091
Helium resources of the United States, 1991
[PB93-189652] p 3743 N93-31116
HELIUM-NEON LASERS
Investigation of diamond homoepitaxy by in situ Fizeau interferometry: The role of oxygen
[AD-A265544] p 3829 N93-31921
HELMET MOUNTED DISPLAYS
Integration of advanced teleoperation technologies for control of space robots p 3784 N93-32107
HEMATITE
Reflectance spectroscopy and GEX simulation of palagonite and iron-rich montmorillonite clay mixtures: Implications for the surface composition of Mars
p 3865 N93-31954
HEMATOLOGY
Fundamental diagnostic hematology: Anemia (second edition)
[PB93-188662] p 3773 N93-31140
Fundamental diagnostic hematology: The bleeding and clotting disorders (second edition)
[PB93-188670] p 3773 N93-31158
HEMOSTATICS
Fundamental diagnostic hematology: The bleeding and clotting disorders (second edition)
[PB93-188670] p 3773 N93-31158
HERMES MANNED SPACEPLANE
Constrained motion models for insertion/extraction operations applied to the Hermes robot arm: A feasibility study
[NLR-TP-91485-U] p 3736 N93-32204
HETERODYNING
Report of the submillimeter splinter group
p 3847 N93-31770
HETEROJUNCTION DEVICES
Scattering of electrons at heterostructure interfaces
[ETN-93-94044] p 3828 N93-31523
Light-induced band-structure modifications in modulation-doped 3-5 semiconductor heterostructures
[ETN-93-94053] p 3828 N93-31619
Carrier capture in 3-5 semiconductor quantum wells
[ETN-93-94054] p 3828 N93-31620
HETEROJUNCTIONS
Electronic Landau levels in quantum wells with periodically structured interfaces
[DE93-608514] p 3828 N93-31664
HEURISTIC METHODS
ALGODESK: An experimental comparison of eight evolutionary heuristics applied to the QAP problem
[REPT-92-052] p 3786 N93-31250
Generation and exploration of aggregation abstractions for scheduling and resource allocation
p 3835 N93-32128
Massively parallel support for a case-based planning system p 3797 N93-32135
Decision theory for computing variable and value ordering decisions for scheduling problems
p 3835 N93-32137
An on-line expert system for diagnosing environmentally induced spacecraft anomalies using CLIPS
p 3794 N93-32142
Enhancements to the Engine Data Interpretation System (EDIS)
[NASA-CR-193363] p 3800 N93-32230
Ant system for job-shop scheduling
[REPT-92-066] p 3792 N93-32346
HIERARCHIES
A new definition of the subtype relation
[AD-A265548] p 3791 N93-32066
Combining qualitative and quantitative spatial and temporal information in a hierarchical structure: Approximate reasoning for plan execution monitoring
p 3835 N93-32132
HIGH ENERGY ELECTRONS
Utilization of high energy electron beam in the treatment of drinking and waste water
[DE92-642335] p 3783 N93-32406
HIGH ENERGY INTERACTIONS
Proceedings of the Workshop on Application of Circularly Polarized X Rays in the Region of 1 to 8 keV
[DE93-704276] p 3823 N93-31165
Supercritical pomeron and spin effects in meson-nucleon scattering at high energy
[DE93-608327] p 3818 N93-31242
HIGH FREQUENCIES
Advanced infrared spectroscopy for improved characterization of chemical systems
[PB93-174977] p 3703 N93-31875
HIGH POWER LASERS
Optically guided laser wakefield acceleration
[AD-A265441] p 3732 N93-32019
HIGH PRESSURE
Constitutive and damage material modeling in a high pressure hydrogen environment p 3696 N93-31577
HIGH RESOLUTION
The Large Angle Spectroscopic Coronagraph (LASCO): Visible light coronal imaging and spectroscopy
p 3868 N93-31350
Development of high resolution imaging detectors for x ray astronomy
[NASA-CR-193653] p 3851 N93-32363
HIGH TEMPERATURE
High temperature superconducting films and multilayers for electronics
[AD-A264410] p 3828 N93-31190

Progress in speckle-shift strain measurement
p 3693 N93-31558

HIGH TEMPERATURE ENVIRONMENTS
Application of the SAHA equation to high temperature (greater than or equal to 6000 K) rocket exhaust
[AD-A264004] p 3692 N93-31291
A model for predicting high-temperature fatigue failure of a W/Cu composite p 3696 N93-31579
The effects of cockpit heat on aviator sleep parameters p 3782 N93-32266

HIGH TEMPERATURE GASES
The thermodynamic and structural contributions to the vacancy formation energies in hot rare gas solids
[DE93-604742] p 3827 N93-31086
Study of wall heat transfer from a high temperature dissociated hydrogen impinging jet
[DE92-017845] p 3698 N93-32184

HIGH TEMPERATURE SUPERCONDUCTORS
Microscopic origin of marginal Fermi-liquid in strongly correlated spin systems
[DE93-608697] p 3827 N93-31163
Physical characterization and study of the electrical magnetic and thermal properties of the ceramic high Tc superconductor Y1Ba2Cu3O(7-x)
[DE92-640219] p 3711 N93-32187
On the superconductivity existence within the Hubbard model
[DE93-613987] p 3830 N93-32280
BCS universal constants for high-temperature superconductivity
[DE92-642079] p 3830 N93-32405

HIGH TEMPERATURE TESTS
Axial and torsional fatigue behavior of a cobalt-base alloy p 3697 N93-31582
NASA-UVA Light Aerospace Alloy and Structures Technology Program (LA2ST)
[NASA-CR-193412] p 3706 N93-31739
Hypersonic engine component experiments in high heat flux, supersonic flow environment
[NASA-TM-106273] p 3726 N93-31860

HIGH THRUST
A high thrust density, C60 cluster, ion thruster
[AD-A264405] p 3691 N93-31188

HIGHLY MANEUVERABLE AIRCRAFT
Advanced aircraft with thrust vector control
[MBB-FE-1-S-PUB-0504] p 3678 N93-31043

HILBERT SPACE
Differential inclusions governed by convex and nonconvex perturbation of a sweeping process
[DE92-644668] p 3802 N93-31160
The nth roots with Hilbert-Schmidt defect operator of normal contractions
[DE93-608163] p 3803 N93-31288
The linear quadratic digital control of infinite-dimensional systems with unbounded input and output operators
[REPT-92-49] p 3798 N93-31483
Finite-dimensional approximation for operator equations of Hammerstein type
[DE93-619669] p 3809 N93-32286

HIPPARCOS SATELLITE
The need of very accurate optical astrometry by interferometric techniques p 3844 N93-31751
Interferometer concepts for astrometry in space
p 3691 N93-31788

HOLES (ELECTRON DEFICIENCIES)
Numerical studies of low temperature gallium arsenide buffer layers and their influence on device operation
[AD-A264296] p 3829 N93-32083

HOLOGRAPHY
Pulse holographic measurement techniques
[DE93-607634] p 3729 N93-31835

HOMOLOGY
BRST cohomology ring in 2D gravity coupled to minimal models
[DE93-608192] p 3757 N93-31305

HONEYCOMB STRUCTURES
Reusable cryogenic liquid rocket propellant tank
[NASA-CASE-LAR-14172-1] p 3692 N93-31295

HOSPITALS
Micro-organisms, cytotoxins and radioactive preparation: Risks at rescue operations in hospital environment
[FOA-A-40065-4.5] p 3772 N93-32423

HOT STARS
UV interferometry of hot stars p 3848 N93-31774

HOT SURFACES
Transient cooling of a hot surface by droplets evaporation
[PB93-189421] p 3722 N93-31114

HOVERING
Current projects in Fuzzy Control
p 3688 N93-31442

HUMAN BEHAVIOR
The clearance test: A computer generated process for acquisition of auditive short term sensitivity
p 3776 N93-31234
Nutritional and lifestyle status of 50 pilots of the Portugese Air Force p 3780 N93-32255
Personal information management in computer science research
[ISBN-0-315-73783-2] p 3842 N93-32325

HUMAN BEINGS
Man, technology, society and development: From the hunters and gatherers to the first industrial revolution 3.5 million years ago into AD1760
[ISBN-9-03-860102-6] p 3833 N93-31543

HUMAN BODY
Transmission of vibration through the human body to the head: A summary of experimental data
[ISVR-TR-218] p 3774 N93-32237

HUMAN FACTORS ENGINEERING
Probabilistic simulation of the human factor in structural reliability p 3696 N93-31573
System engineering concept demonstration, interface standards studies, volume 4
[AD-A265470] p 3791 N93-32024
The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992)
[NASA-CP-3187-VOL-1] p 3883 N93-32097
Air Force research in human sensory feedback for telepresence p 3801 N93-32109
Human factors and the safety of flights: The importance of the management of sleep p 3782 N93-32267
Health maintenance facility system effectiveness testing
[NASA-TM-104737] p 3783 N93-32328

HUMAN PERFORMANCE
Probabilistic simulation of the human factor in structural reliability p 3696 N93-31573
Selection of personnel for stressful occupations: The potential utility of psychophysiological measures as selection tools
[AD-A264571] p 3776 N93-32011
A decision-theoretic approach to the display of information for time-critical decisions: The Vista project
p 3784 N93-32152

HUMAN REACTIONS
Reaction to aircraft noise near general aviation airfields
[DORA-8203] p 3817 N93-32377

HUMAN RESOURCES
Air Force construction automation/robotics
p 3715 N93-32110

HYBRID COMPOSITES
Method for producing hybrid graphite composite
[NASA-CASE-LEW-15241-2] p 3700 N93-31296

HYDRATION
Preliminary results of an experimental study of the interactions of basalt glass and a water vapor atmosphere: Implications for weathering on Mars
p 3864 N93-31948

HYDRAULIC CONTROL
Pulse-modulated control of switching valves for an electro-hydraulic servo actuator
[DLR-FB-92-18] p 3719 N93-31462

HYDRAULIC EQUIPMENT
Life extending control: An interdisciplinary engineering thrust p 3697 N93-31581

HYDROCARBON FUELS
New directions for the catalytic conversion of methane
[PB93-188795] p 3702 N93-31435

HYDROCARBONS
Regional modeling analysis of the dependencies of atmospheric oxidants to perturbations in NOx and hydrocarbon emissions
[PB93-180925] p 3754 N93-32070

HYDRODYNAMIC EQUATIONS
The performance of PAGOSA on several MIMD parallel computers
[DE93-003243] p 3786 N93-31183
Mass motion of a heated plasma blob in a coronal loop p 3874 N93-31384
Pulse-beam heating in flare loops
p 3875 N93-31392

HYDRODYNAMICS
On the verification of a theory for sculling propulsion
[ETN-93-94040] p 3725 N93-31519
Radiative preheat in strongly coupled, laser accelerated plasmas
[AD-A265442] p 3826 N93-32020
Proceedings of the First Geological Materials Constitutive Modeling Workshop
[DE93-009161] p 3765 N93-32176
Ceramics models in the MESA codes
[DE93-000683] p 3711 N93-32186

HYDROGEN
KDP 903
[DE93-715539] p 3818 N93-31167
SWAN: A study of solar wind anisotropies
p 3868 N93-31351
Interplanetary hydrogen gas as a monitor of the Sun's corpuscular and radiative output p 3878 N93-31412
Effects of hydrogen and electron diffusion on trace species diffusion in the solar atmosphere
p 3878 N93-31413
The effect of porosity and gamma-gamma' eutectic content on the low cycle fatigue behavior of hydrogen-charged PWA-1480 p 3696 N93-31576
Constitutive and damage material modeling in a high pressure hydrogen environment p 3696 N93-31577
Infrared spectroscopy of hydrogen and water on diamond (100)
[AD-A265531] p 3704 N93-31920
Si atomic layer epitaxy based on Si2H6 and remote He plasma bombardment
[DE93-011674] p 3830 N93-32183
Study of wall heat transfer from a high temperature dissociated hydrogen impinging jet
[DE92-017845] p 3698 N93-32184

HYDROGEN BONDS
KDP 903
[DE93-715539] p 3818 N93-31167
NTO polymorphs
[DE93-005451] p 3712 N93-31186

HYDROGEN EMBRITTLEMENT
Japan's Sunshine Project
[DE93-768157] p 3749 N93-32041
Japan's Sunshine Project
[DE93-768166] p 3749 N93-32042

HYDROGEN FUELS
Japan's Sunshine Project
[DE93-768157] p 3749 N93-32041
Japan's Sunshine Project
[DE93-768166] p 3749 N93-32042

HYDROGEN OXYGEN ENGINES
Radiation/convection coupling in rocket motor and plume analysis
[NASA-CR-193288] p 3698 N93-31845
Hypersonic engine component experiments in high heat flux, supersonic flow environment
[NASA-TM-106273] p 3726 N93-31860

HYDROGEN PRODUCTION
Japan's Sunshine Project
[DE93-768157] p 3749 N93-32041
Japan's Sunshine Project
[DE93-768166] p 3749 N93-32042

HYDROGEN-BASED ENERGY
Japan's Sunshine Project
[DE93-768157] p 3749 N93-32041
Japan's Sunshine Project
[DE93-768166] p 3749 N93-32042

HYDROGEOLOGY
Acoustic logging for structural and hydrogeological bedrock investigations
[VTT-JULK-762] p 3816 N93-31865

HYDROGRAPHY
Hydrographic observations in the western tropical and subtropical North Atlantic Ocean: Atlantic Climate Change Program (ACCP) and Western Tropical Atlantic Experiment (WESTRAX) during 1991
[PB93-184778] p 3770 N93-31832

HYDROLOGY
Effects of low-level radioactive-waste disposal on water chemistry in the unsaturated zone at a site near Sheffield, Illinois, 1982-1984
[PB93-183051] p 3752 N93-31829

HYDROLOGY MODELS
Statistical and numerical methods in control and identification
[AD-A264676] p 3811 N93-32016

HYDROSTATIC PRESSURE
A universal mass in (2+1)-dimensions
[DE93-609888] p 3832 N93-31911

HYPERSONIC AIRCRAFT
Calculations on unsteady type 4 interaction at Mach 8
[AD-A265214] p 3673 N93-32004
Analytical and experimental investigations of the oblique detonation wave engine concept
[NASA-TM-102839] p 3683 N93-32374

HYPERSONIC BOUNDARY LAYER
Reynolds number influences in aeronautics
[NASA-TM-107730] p 3673 N93-31732

HYPERSONIC FLIGHT
Evaluation of candidate working fluid formulations for the electrothermal-chemical wind tunnel
[NASA-CR-193366] p 3684 N93-31848
Hypersonic engine component experiments in high heat flux, supersonic flow environment
[NASA-TM-106273] p 3726 N93-31860

HYPERSONIC FLOW
Calculations on unsteady type 4 interaction at Mach 8
[AD-A265214] p 3673 N93-32004

HYPERSONIC SPEED
Calculations on unsteady type 4 interaction at Mach 8
[AD-A265214] p 3673 N93-32004

HYPERSONIC VEHICLES
Parametric studies of shock wave/boundary layer interactions over 2D compression corners at Mach 6
[VKI-TN-181] p 3672 N93-31538
HYPERSONIC WIND TUNNELS
Evaluation of candidate working fluid formulations for the electrothermal-chemical wind tunnel
[NASA-CR-193366] p 3684 N93-31848
HYPERSONICS
Technology transfer: Potential of BMFT concept for hypersonics
[MBB-LME-202-S-PUB-0505] p 3843 N93-31045
Evaluation of candidate working fluid formulations for the electrothermal-chemical wind tunnel
[NASA-CR-193366] p 3684 N93-31848
HYPOGLYCEMIA
Idiopathic Reactive Hypoglycemia in a population of healthy trainees of an Italian Air Force military school
p 3779 N93-32248
HYPOKINESIA
Protein requirements in hypoxia or hypokinesia
p 3778 N93-32244
HYPOTHALAMUS
Melatonin, the pineal gland, and circadian rhythms
[AD-A264099] p 3772 N93-31061
Organization of the human circadian system
[AD-A264675] p 3774 N93-32015
HYPOXIA
Protein requirements in hypoxia or hypokinesia
p 3778 N93-32244

I

ICE
Blasim: A computational tool to assess ice impact damage on engine blades
[NASA-TM-106225] p 3740 N93-31193
Basal hydraulic conditions of Ice Stream B
p 3762 N93-31898
ICE CLOUDS
Scattering by irregular particles in anomalous diffraction and discrete dipole approximations
p 3817 N93-31154
ICE ENVIRONMENTS
Radar studies of the West Antarctic ice streams
p 3760 N93-31891
Mass balance assessment using GPS
p 3761 N93-31892
Airborne gravity and other geophysical techniques for understanding the lithosphere beneath the West Antarctic Ice Sheet p 3761 N93-31894
Aerogeophysical evidence for active volcanism beneath the West Antarctic Ice Sheet p 3761 N93-31895
ICE FLOES
SPOT satellite mapping of Ice Stream B
p 3760 N93-31887
ICE FORMATION
Navy tactical applications guide, part 2, volume 8: Arctic-East Siberian/Chukchi/Beaufort Seas. Weather analysis and forecast applications
[AD-A265585] p 3768 N93-31922
Climatic effects of harmful emissions from high altitude air traffic p 3752 N93-31926
IGNEOUS ROCKS
On the weathering of Martian igneous rocks
p 3862 N93-31941
IMAGE ANALYSIS
Automatic recognition of solar features
p 3880 N93-31421
Manipulating remotely-sensed data with Khoros
[DE93-012622] p 3842 N93-32298
IMAGE CLASSIFICATION
Manipulating remotely-sensed data with Khoros
[DE93-012622] p 3842 N93-32298
IMAGE FILTERS
AOTF enhancements for a space-based spectropolarimeter
[NASA-CR-193290] p 3691 N93-31040
IMAGE PROCESSING
A design for a visual motion transducer
[OUEL-1960/92] p 3785 N93-31054
A framework for spatio-temporal control in the tracking of visual contours
[OUEL-1961/92] p 3785 N93-31055
On board image processing for telescience support
[NLR-TP-91213-U] p 3823 N93-31056
Computing with neural maps: Application to perceptual and cognitive function
[AD-A264092] p 3743 N93-31060
On-board derived flight-path measurement as demonstrated by an ILS measurement system
p 3677 N93-31282
Testing of an experimental system for image reconnaissance p 3677 N93-31283
Fractal image coding techniques and contraction operators
[REPT-92-93] p 3789 N93-31632
Remote driving with reduced bandwidth communication p 3719 N93-32114
Using machine learning techniques to automate sky survey catalog generation p 3843 N93-32143
Automatic Target Recognition (ATR) using Distributed Associative Memories (DAMS)
[AD-A265613] p 3800 N93-32169
Upgrade of the LIMDAS day/night whole sky imager
[AD-A265871] p 3769 N93-32171
Manipulating remotely-sensed data with Khoros
[DE93-012622] p 3842 N93-32298
Expansion-based passive ranging
[NASA-TM-104025] p 3678 N93-32348
IMAGE RECONSTRUCTION
Extracting projective information from single views of 3D point sets
[OUEL-1927/92] p 3785 N93-31151
Four dimensional reconstruction and analysis of plume images p 3694 N93-31561
Spectro-imagery with a Rotating Slip-Aperture Telescope (RSAT): Cophasing successive projections in the radon plane p 3849 N93-31779
Study of an optimized configuration for interferometric imaging of complex and extended solar structures
p 3849 N93-31780
IMAGE RESOLUTION
Software to model AXAF image quality
[NASA-CR-192574] p 3789 N93-31637
Development of high resolution imaging detectors for x ray astronomy
[NASA-CR-193653] p 3851 N93-32363
IMAGE TRANSDUCERS
A design for a visual motion transducer
[OUEL-1960/92] p 3785 N93-31054
IMAGERY
Upgrade of the LIMDAS day/night whole sky imager
[AD-A265871] p 3769 N93-32171
IMAGING SPECTROMETERS
AOTF enhancements for a space-based spectropolarimeter
[NASA-CR-193290] p 3691 N93-31040
Composition of weakly altered Martian crust: Clues from imaging spectroscopy p 3865 N93-31952
IMAGING TECHNIQUES
3D reconstruction methods of coronal structures by radio observations p 3874 N93-31387
Hybrid rendering of scientific data using an h-buffer
[REPT-92-68] p 3788 N93-31495
A proposal on the quality of the binary thresholds of a contour detection
[REPT-91-075] p 3806 N93-31544
An integrated eddy current detection and imaging system on a silicon chip p 3693 N93-31560
Four dimensional reconstruction and analysis of plume images p 3694 N93-31561
Computerized tomography and its applications: A guided tour
[CS-9206] p 3789 N93-31629
Fractal coding of monochrome images
[REPT-92-99] p 3790 N93-31656
Ultraviolet imaging interferometry
p 3844 N93-31752
Visible and infrared imaging interferometry from space
p 3844 N93-31753
Spectro-imagery with a Rotating Slip-Aperture Telescope (RSAT): Cophasing successive projections in the radon plane p 3849 N93-31779
Composition of weakly altered Martian crust: Clues from imaging spectroscopy p 3865 N93-31952
The application of two-dimensional imaging to very high energy gamma ray astronomy
[DE93-012326] p 3851 N93-32160
Upgrade of the LIMDAS day/night whole sky imager
[AD-A265871] p 3769 N93-32171
SeaWiFS Technical Report Series. Volume 4: An analysis of GAC sampling algorithms: A case study
[NASA-TM-104566-VOL-4] p 3771 N93-32360
IMPACT DAMAGE
Consideration of impact damages by dimensioning CFC (Carbon Fiber Reinforced Composites) components
[MBB-FE-221-S-PUB-0501] p 3699 N93-31044
Blasim: A computational tool to assess ice impact damage on engine blades
[NASA-TM-106225] p 3740 N93-31193
Impact response of laminated plates subjected to transverse loading p 3740 N93-31645
Performance of an impact loaded sandwich plate
[VTT-JULK-767] p 3702 N93-32388
IMPACT LOADS
Blasim: A computational tool to assess ice impact damage on engine blades
[NASA-TM-106225] p 3740 N93-31193
IMPACT RESISTANCE
Impact response of laminated plates subjected to transverse loading p 3740 N93-31645
IMPACT STRENGTH
Evaluation of the chevron notch fracture toughness test for brittle materials
[NPL-DMM(A)-72] p 3742 N93-32384
IMPACT TESTS
Impact response of laminated plates subjected to transverse loading p 3740 N93-31645
Ceramics models in the MESA codes
[DE93-000683] p 3711 N93-32186
Performance of an impact loaded sandwich plate
[VTT-JULK-767] p 3702 N93-32388
IMPACT TOLERANCES
Consideration of impact damages by dimensioning CFC (Carbon Fiber Reinforced Composites) components
[MBB-FE-221-S-PUB-0501] p 3699 N93-31044
IMPEDANCE
Measurements and analysis of the equivalent circuit of the GEC RF Reference Cell
[DE93-013498] p 3718 N93-32425
IMPINGEMENT
Study of wall heat transfer from a high temperature dissociated hydrogen impinging jet
[DE92-017845] p 3698 N93-32184
IMPLICATION
Weak equivalence: Theory and applications
[CT-92-02] p 3788 N93-31529
IMPULSES
Determination of design and operation parameters for upper atmospheric research instrumentation to yield optimum resolution with deconvolution, appendix 3
[NASA-CR-192835] p 3766 N93-32231
IMPURITIES
On the magnetoresistance of heavy fermion compounds
[DE93-608691] p 3827 N93-31098
IN SITU MEASUREMENT
Investigation of diamond homoepitaxy by in situ Fizeau interferometry: The role of oxygen
[AD-A265544] p 3829 N93-31921
INCINERATORS
Methodology to apportion ambient air measurements to investigate potential effects on air quality near waste incinerators
[PB93-191393] p 3754 N93-32088
INCLUSIONS
Differential inclusions governed by convex and nonconvex perturbation of a sweeping process
[DE92-644668] p 3802 N93-31160
Existence of viable solutions for nonconvex-valued differential inclusions in Banach spaces
[DE92-644669] p 3803 N93-31285
INCOHERENT SCATTERING
Meteor impacts, sporadic E layer formation and the incoherent scatter method
[IRF-SF-210] p 3852 N93-31624
INCOMPRESSIBLE FLOW
Contribution to the experimental and theoretical study of vortex breakdown
[ONERA-NT-1990-12] p 3724 N93-31477
Termination criteria for GMRES-like methods to solve the discretized incompressible Navier-Stokes equations
[REPT-92-50] p 3724 N93-31484
Numerical study of a multigrid method with four smoothing methods for the incompressible Navier-Stokes equations in general coordinates
[REPT-93-04] p 3725 N93-31547
Galerkin coarse grid approximation in multigrid for the incompressible Navier-Stokes equations
[REPT-92-103] p 3726 N93-31658
An incompressible axisymmetric through-flow calculation procedure for design and off-design analysis of turbomachinery
[AD-A264933] p 3726 N93-32071
A p-version finite element method for steady incompressible fluid flow and convective heat transfer
[NASA-TM-106260] p 3727 N93-32370
INCOMPRESSIBLE FLUIDS
A p-version finite element method for steady incompressible fluid flow and convective heat transfer
[NASA-TM-106260] p 3727 N93-32370
INDEPENDENT VARIABLES
Least squares orthogonal polynomial approximation in several independent variables
[DE93-609832] p 3802 N93-31180
Estimation of density functionals
[REPT-92-98] p 3807 N93-31655
INDEXES (DOCUMENTATION)
On the selection of an optimal set of secondary indices
[MEMO-INF-92-68] p 3789 N93-31617
European aerospace science and technology, 1992: A bibliography with indexes
[NASA-SP-7105] p 3671 N93-32404

INDIUM
Laser-assisted chemical vapor deposition of InN on Si(100)
[AD-A264266] p 3731 N93-31095
INDIUM PHOSPHIDES
An electron cyclotron resonance plasma process for InP passivation
[AD-A265036] p 3826 N93-31998
Non-destructive, ultra-low resistance, thermally stable contacts for use on shallow junction InP solar cells
[NASA-TM-106228] p 3750 N93-32201
INDUCTION
An annotated bibliography of inductive learning since 1985
[REPT-92-74] p 3833 N93-31507
INDUSTRIAL MANAGEMENT
Applying MORT maintenance safety analysis in Finnish industry
[VTT-TIED-1332] p 3714 N93-31545
INDUSTRIAL SAFETY
Near miss reporting in the chemical process industry
[ISBN-9-03-860181-6] p 3714 N93-31539
INDUSTRIAL WASTES
RCRA implementation plan, FY 1993
[PB93-176956] p 3752 N93-31877
INDUSTRIES
Chemical effects of ionizing radiations and electron beam in polymers: Industrial uses
[DE93-609337] p 3708 N93-31179
End users: New products and services
p 3837 N93-31220
The technology base for agile manufacturing
p 3715 N93-32104
INELASTIC SCATTERING
Theory of deep-inelastic scattering reactions and x-rescaling model
[DE93-604519] p 3820 N93-31821
Nuclear structure effects in elastic and inelastic scattering of light ions
[DE93-616909] p 3822 N93-32407
INERTIA
Robust stability of second-order systems
[NASA-CR-193624] p 3809 N93-32373
INERTIAL NAVIGATION
On-board derived flight-path measurement as demonstrated by an ILS measurement system
p 3677 N93-31282
INFERENCE
Modeling and inference for transient tracers on oceanic flow
[AD-A265428] p 3770 N93-32037
Mixed data/goal driven intelligent real-time assessment and control p 3794 N93-32140
INFILTRATION
Preferential flow effects on chemical transport and retardation in soils
[PB93-190668] p 3723 N93-31204
INFORMATION
Publication catalogue of VTT in 1991
[VTT-TIED-1340] p 3838 N93-31535
The technology base for agile manufacturing
p 3715 N93-32104
Information for the user in design of intelligent systems p 3801 N93-32149
INFORMATION DISSEMINATION
The effect of changes in markets and trade barriers on the exchange of scientific and technical information
p 3836 N93-31216
Newly available technologies present expanding opportunities for scientific and technical information exchange p 3837 N93-31217
Automating multilingual communication
p 3837 N93-31219
The modern research environment
p 3837 N93-31221
The management of change: Implications for the information professional p 3838 N93-31222
Science Information Systems Newsletter, issue 28
[NASA-TM-108266] p 3834 N93-31589
Standardization Directory: FSC class and area assignments
[AD-A265686] p 3839 N93-31796
INFORMATION FLOW
A note on dynamic arrow logic
[LP-92-11] p 3788 N93-31532
A blueprint for a parallel parser generator
[MEMO-INF-92-65] p 3795 N93-31616
Performance analysis of a large-grain dataflow scheduling paradigm
[NASA-TP-3323] p 3796 N93-32213
INFORMATION MANAGEMENT
Modernization and new technologies: Coping with the information explosion
[NASA-TM-109410] p 3838 N93-31315
Manual for data administration
[PB93-182053] p 3834 N93-31431
TSCA confidential business information security manual
[PB93-184844] p 3839 N93-31833
Automated Assembly Center (AAC)
p 3686 N93-32123
Automation and hypermedia technology applications
p 3843 N93-32155
Personal information management in computer science research
[ISBN-0-315-73783-2] p 3842 N93-32325
INFORMATION PROCESSING (BIOLOGY)
The concentration loading test system: A computer generated process for acquisition of attentiveness control p 3776 N93-31235
High level cognitive information processing in neural networks
[NASA-CR-193296] p 3800 N93-32341
INFORMATION RETRIEVAL
End users: New products and services
p 3837 N93-31220
The modern research environment
p 3837 N93-31221
Neural nets and their relevance for information retrieval
[CL-91-02] p 3798 N93-31469
The computer integrated documentation project: A merge of hypermedia and AI techniques
p 3801 N93-32148
Knowledge based document retrieval in office environments: The Kabiria system
[REPT-92-032] p 3843 N93-32389
Coordinating Council. Tenth Meeting: Information retrieval: The role of controlled vocabularies
[NASA-TM-108764] p 3843 N93-32403
INFORMATION SYSTEMS
The Impact of Changing International Relations on the Scientific and Technical Community
[AGARD-CP-523] p 3836 N93-31215
Newly available technologies present expanding opportunities for scientific and technical information exchange p 3837 N93-31217
The modern research environment
p 3837 N93-31221
Forecasting and planning for changing patterns of Scientific and Technical Communication (STC)
p 3838 N93-31223
A catalog of landscape features. A modeling instrument for the ATKIS information system p 3745 N93-31264
Access and content of the EDBS topographic-cartographic information system (ATKIS)
p 3745 N93-31267
A searching method in a declarative city map
p 3746 N93-31270
Modernization and new technologies: Coping with the information explosion
[NASA-TM-109410] p 3838 N93-31315
Information systems as coalgebras
[ML-92-08] p 3838 N93-31481
Design and implementation strategies
[MEMO-INF-92-57] p 3788 N93-31511
Science Information Systems Newsletter, issue 28
[NASA-TM-108266] p 3834 N93-31589
Standardization Directory: FSC class and area assignments
[AD-A265686] p 3839 N93-31796
Accessing Earth science data from the EOS data and information system p 3840 N93-31968
Internation aircraft operator information system
[DOT/FAA/CT-93/4] p 3671 N93-32232
Data communication network at the ASRM facility
[NASA-CR-193625] p 3686 N93-32236
Is time a real time? An overview of time ontology in informatics
[REPT-92-046] p 3842 N93-32383
INFORMATION THEORY
Parametric and combinatorial problems in constrained optimization
[AD-A265595] p 3792 N93-32096
INFORMATION TRANSFER
The Impact of Changing International Relations on the Scientific and Technical Community
[AGARD-CP-523] p 3836 N93-31215
The effect of changes in markets and trade barriers on the exchange of scientific and technical information
p 3836 N93-31216
Automating multilingual communication
p 3837 N93-31219
The modern research environment
p 3837 N93-31221
The management of change: Implications for the information professional p 3838 N93-31222
Forecasting and planning for changing patterns of Scientific and Technical Communication (STC)
p 3838 N93-31223
Research in transparent informed prefetching
[AD-A265417] p 3842 N93-32049
Air Force research in human sensory feedback for telepresence p 3801 N93-32109
INFRARED ASTRONOMY
The 1st International Conference on Millimeter Wave and Far-Infrared Technology
[AD-A264268] p 3715 N93-31096
INFRARED IMAGERY
Surface winds over West Antarctica
p 3763 N93-31903
Determination of the robustness of passive microwave measurements and derivative parameters for use in precipitation discrimination over land
[AD-A265492] p 3768 N93-32008
INFRARED INTERFEROMETERS
Visible and infrared imaging interferometry from space
p 3844 N93-31753
IR single-mode fiber optics for double Fourier interferometry p 3824 N93-31784
INFRARED PHOTOMETRY
Visible and infrared investigations of planet-crossing asteroids and outer solar system objects
[NASA-CR-193511] p 3844 N93-31604
INFRARED RADIATION
Precipitation hardening of infrared transmitting ZnS ceramics
[AD-A265184] p 3710 N93-31993
Satellite Test Assistant Robot (STAR)
p 3690 N93-32111
INFRARED SCANNERS
Fire protection for launch facilities using machine vision fire detection p 3687 N93-32113
INFRARED SPECTRA
Visible and infrared investigations of planet-crossing asteroids and outer solar system objects
[NASA-CR-193511] p 3844 N93-31604
Advanced infrared spectroscopy for improved characterization of chemical systems
[PB93-174977] p 3703 N93-31875
Infrared optical properties of Mars soil analog materials: Palagonites p 3866 N93-31957
An analysis of the composition of auroral emissions in the near infrared
[AD-A265493] p 3764 N93-32009
Infrared multiple photon dissociation spectra of gaseous ions
[AD-A264378] p 3821 N93-32032
Structural characterization of nylon 7 by solid-state NMR, DSC, and ATR-FTIR
[AD-A265800] p 3822 N93-32312
INFRARED SPECTROSCOPY
Advanced infrared spectroscopy for improved characterization of chemical systems
[PB93-174977] p 3703 N93-31875
Infrared spectroscopy of hydrogen and water on diamond (100)
[AD-A265531] p 3704 N93-31920
Synthesis and characterization of copolymers of nylon 11 and nylon 12
[AD-A265841] p 3711 N93-32314
INJECTORS
Enhancement of single phase forced convection heat transfer in tubes and ducts using tangential flow injection
[PB93-189975] p 3723 N93-31210
Examination of the effect of propulsion system performance variables on the life prediction for the SSME Lox Post p 3697 N93-31580
Spray characteristics of two types of fuel injectors
[PB93-180859] p 3736 N93-32069
Innovative instrument design and applications in super-critical fluid chromatography and extraction
p 3704 N93-32327
INLET FLOW
Three-dimensional flow calculations inside SSME GGGT first stage blade rows p 3697 N93-31585
INLET TEMPERATURE
Initial results from the NASA-Lewis wave rotor experiment
[NASA-TM-106148] p 3683 N93-32368
INPUT/OUTPUT ROUTINES
New architectures to reduce I/O bottlenecks in high-performance systems
[DE93-009059] p 3795 N93-31985
Research in transparent informed prefetching
[AD-A265417] p 3842 N93-32049
INSPECTION
Calibration system for testing laboratory
[VTT-TIED-1401] p 3738 N93-31172
Pulse holographic measurement techniques
[DE93-607634] p 3729 N93-31835
Remote surface inspection system
p 3739 N93-32099
An overview of the Kennedy Space Center robotics program p 3691 N93-32124

INSTRUMENT ERRORS
A break-down of sting interference effects
[NLR-TP-91220-U] p 3684 N93-31042
Test measurements for quick analog digital converters for an x ray CCD camera
[ETN-93-94204] p 3728 N93-31119
Measurement uncertainty considerations for coordinate measuring machines
[PB93-189819] p 3714 N93-31196
Measurement uncertainties of the NCAR air motion systems
[PB93-184208] p 3764 N93-32068
INSTRUMENT LANDING SYSTEMS
On-board derived flight-path measurement as demonstrated by an ILS measurement system
p 3677 N93-31282
INSULATION
Analysis of effective thermal conductivity of fibrous materials
[NASA-CR-193242] p 3709 N93-31636
INTEGERS
Smallest regular graphs with given diameter
[MEMO-1092] p 3810 N93-32399
INTEGRAL CALCULUS
Case studies in the numerical solution of oscillatory integrals
[DE92-642554] p 3801 N93-31067
INTEGRAL EQUATIONS
Iterative equation solving techniques in boundary element analysis p 3802 N93-31141
Convergence rates and finite-dimensional approximations for nonlinear ill-posed problems involving monotone operators in Banach spaces
[DE93-619670] p 3809 N93-32287
INTEGRALS
Case studies in the numerical solution of oscillatory integrals
[DE92-642554] p 3801 N93-31067
INTEGRATED CIRCUITS
Synthesis and realization of a monolithic active bandpass filter for the Ku band
[LAAS-92365] p 3719 N93-31173
An integrated eddy current detection and imaging system on a silicon chip p 3693 N93-31560
INTEGRATED OPTICS
Integrated optics for an interferometric link
p 3824 N93-31783
INTEGRATORS
Grand challenges in mass storage: A system integrator's perspective p 3840 N93-31973
INTERACTIVE CONTROL
Interactive and cooperative sensing and control for advanced teleoperation p 3784 N93-32108
INTERFACE STABILITY
Advanced alternate planar geometry solid oxide fuel cells
[DE93-000248] p 3721 N93-32174
INTERFACES
The prominence-corona interface: Models and observations p 3873 N93-31378
Scattering of electrons at heterostructure interfaces
[ETN-93-94044] p 3828 N93-31523
INTERFACIAL TENSION
Localization and transport in random media
[AD-A264640] p 3726 N93-32014
INTERFEROMETERS
A self-aligning interferometer suitable for white or monochromatic light consisting solely of a mirror and a reflection grating, part 2
[DE93-609517] p 3823 N93-31246
Plasma waves interferometry on Cluster
p 3827 N93-31714
Submillimeter interferometry p 3845 N93-31754
Prospects for Earth-based interferometry
p 3845 N93-31755
Interferometry from the Moon p 3845 N93-31757
Space-based astrometric optical interferometry with POINTS p 3845 N93-31758
The SUN/SIMURIS interferometer
p 3845 N93-31759
The VLT interferometer: Current status and expectations for the next 20 years p 3846 N93-31763
SISTERS: A space interferometer for the search for terrestrial exo-planets by rotation shearing
p 3846 N93-31764
The lunar interferometer for solar physics
p 3847 N93-31768
Advanced lunar-based interferometer for solar observations p 3847 N93-31769
Report of the submillimeter splinter group
p 3847 N93-31770
Study of an optimized configuration for interferometric imaging of complex and extended solar structures
p 3849 N93-31780
Exploring the limits of adaptive wavefront compensation for ground based astronomical interferometers
p 3849 N93-31782
Interferometry at the vacuum ultra-violet limit
p 3850 N93-31785
HARDI: A High Angular Resolution Deployable Interferometer p 3850 N93-31786
A concept of deployable tethered interferometer
p 3691 N93-31787
Interferometer concepts for astrometry in space
p 3691 N93-31788
INTERFEROMETRY
Targets for Space-Based Interferometry
[ESA-SP-354] p 3844 N93-31750
Wavefront reconstruction from three dimensional intensity measurements
[DE93-609881] p 3832 N93-31909
Investigation of diamond homoepitaxy by in situ Fizeau interferometry: The role of oxygen
[AD-A265544] p 3829 N93-31921
INTERIOR BALLISTICS
A survey of codes for modeling electromagnetic launch
[AD-A264946] p 3687 N93-32074
INTERLAMINAR STRESS
Design of multiple-ply laminated composite tapered beams
[NASA-TM-108411] p 3700 N93-31650
INTERNAL WAVES
Orographically forced internal-wave instability
[ISBN-0-315-73891-X] p 3757 N93-31106
Eddy vortices produced by nonlinear reflection of a gravity wave at a critical level p 3757 N93-31155
U.S. National weather experiment STORM-FEST 1992: Wave and turbulence in frontal zones
[AD-A264294] p 3766 N93-31182
Tides of Massachusetts and Cape Cod Bays
[AD-A264790] p 3770 N93-31983
INTERNATIONAL COOPERATION
The Impact of Changing International Relations on the Scientific and Technical Community
[AGARD-CP-523] p 3836 N93-31215
The effect of changes in markets and trade barriers on the exchange of scientific and technical information
p 3836 N93-31216
Coordination of the solar terrestrial science by the IACG: Inter-Agency Consultative Group for Space Science
p 3852 N93-31675
Japan's Sunshine Project
[DE93-768309] p 3748 N93-31811
International Energy Agency's Heat Pump Centre (IEA-HPC) Annual National Team Working Group Meeting
[DE93-009932] p 3750 N93-32281
INTERNATIONAL RELATIONS
The Impact of Changing International Relations on the Scientific and Technical Community
[AGARD-CP-523] p 3836 N93-31215
The effect of changes in markets and trade barriers on the exchange of scientific and technical information
p 3836 N93-31216
INTERNATIONAL SUN EARTH EXPLORERS
Can ULF fluctuations observed at the magnetopause play a role in anomalous diffusion?
p 3855 N93-31693
Mirror mode and other compressive ULF modes
p 3719 N93-31711
INTERNATIONAL SYSTEM OF UNITS
Metrication: An economic wake-up call for US industry
[PB93-188969] p 3714 N93-31109
INTERPLANETARY GAS
Interplanetary hydrogen gas as a monitor of the Sun's corpuscular and radiative output p 3878 N93-31412
INTERPLANETARY MAGNETIC FIELDS
On Short Large Amplitude Magnetic Structures in the vicinity of the quasi-parallel region of the Earth's bow shock p 3854 N93-31688
Plasma transport through magnetic boundaries
p 3827 N93-31692
Magnetospheric convection and current system in the dayside polar cap p 3856 N93-31700
Model of a rotating magnetic cloud
p 3857 N93-31707
Viking observations of electric fields
p 3858 N93-31712
Three-dimensional numerical simulation of interplanetary magnetic field changes at 1 AU as a consequence of simulated solar flares
p 3860 N93-31723
INTERPLANETARY MEDIUM
SWAN: A study of solar wind anisotropies
p 3868 N93-31351
The Charge, Element, and Isotope Analysis System CELIAS on SOHO p 3869 N93-31352
COSTEP: Comprehensive suprathermal and energetic particle analyser for SOHO: Scientific goals and data description p 3869 N93-31353
Detecting and tracking changes in solar wind conditions using interplanetary scintillation p 3857 N93-31703
INTERPOLATION
Curve interpolation with constrained length
[MEMO-1079] p 3804 N93-31467
Tests on semi-Lagrangian transport and interpolation
[CWI-NM-R921M] p 3756 N93-32393
INTERPROCESSOR COMMUNICATION
Evaluating master-slave implementation of double-dot parsing for massive parallel MIMD systems
[REPT-92-78] p 3794 N93-31473
Implementation of interconnect simulation tools in spice
[NASA-CR-193619] p 3792 N93-32239
INTERSTELLAR MASERS
Molecules in the envelope of planetary nebulae with the example of CO-envelope of M2-9
[ETN-93-94203] p 3851 N93-31050
INTERSTELLAR MATTER
Frequency of the chemical elements in B-stars of the local field and dispersion of interstellar medium
[ETN-93-94205] p 3852 N93-31091
Study of ISM turbulence using radiointerferometers (new method) p 3847 N93-31767
Atomic and molecular line observations of galaxies
p 3847 N93-31771
INTERSTITIALS
Fundamental studies of new high-energy permanent magnet materials
[DE93-014707] p 3815 N93-32291
INTERVALS
Efficient estimation of the mean for interval censoring, case 2
[REPT-92-83] p 3811 N93-31491
INVENTORIES
The MICRO-BOSS scheduling system: Current status and future efforts p 3835 N93-32133
INVERSIONS
Mathematical inversion of multiple-scattering of laser light
[DE93-609128] p 3803 N93-31224
The priority inversion problem and real-time symbolic model checking
[AD-A265408] p 3791 N93-32044
INVESTMENT CASTING
Use of titanium castings without a casting factor
[AD-A264414] p 3705 N93-31192
INVISCID FLOW
Numerical simulation of the flow in a 1:57-scale axisymmetric model of a large blast simulator
[AD-A265551] p 3685 N93-31916
NLR inviscid transonic unsteady loads prediction methods in aeroelasticity
[NLR-TP-91410-U] p 3674 N93-32358
ION CURRENTS
The interaction of a moving spacecraft with the ionosphere: Current collection and wake structure
p 3688 N93-31157
ION CYCLOTRON RADIATION
Infrared multiple photon dissociation spectra of gaseous ions
[AD-A264378] p 3821 N93-32032
ION ENGINES
The Thermionic Fuel Element Verification Program: Technical progress and future plans
[DE93-003797] p 3691 N93-31185
ION EXCHANGING
Ion exchange polymers and method for making
[NASA-CASE-LEW-15576-1] p 3709 N93-31316
ION INJECTION
Inertial electrostatic confinement as a power source for electric propulsion
[NASA-TM-109228] p 3692 N93-31310
ION IRRADIATION
Detection of radiation-induced changes in electrochemical properties of austenitic stainless steels using miniaturized specimens and the single-loop electrochemical potentiokinetic reactivation method
[DE93-012865] p 3707 N93-32302
ION PROPULSION
A high thrust density, C60 cluster, ion thruster
[AD-A264405] p 3691 N93-31188
ION SCATTERING
Interaction of solar wind ions with thin carbon foils: Calibration of time-of-flight spectrometers
p 3880 N93-31423
Nuclear structure effects in elastic and inelastic scattering of light ions
[DE93-616909] p 3822 N93-32407

ION SOURCES
Proceedings of the Workshop on Spin-Charge Transfer Reaction in Atomic Collision Process for planning of next period of cascade project
[DE93-704290] p 3821 N93-31834
IONIC COLLISIONS
Pion multiplicity as a probe of the deconfinement transition in heavy-ion collisions
[DE93-608484] p 3817 N93-31059
Momentum transport through the chromosphere
p 3852 N93-31677
Theoretical investigation of electron-positive ion/atom interactions
[DE93-012933] p 3822 N93-32162
IONIC REACTIONS
Interactions between tetraalkylammonium ions and silicates
[ETN-93-94057] p 3703 N93-31622
IONIZATION
One-dimensional numerical simulations of the low-frequency electric fields in the CRIT1 and CRIT2 rocket experiments
[TRITA-ALP-1992-01] p 3758 N93-31625
Possible manifestation of the critical ionization velocity phenomenon in the solar corona p 3861 N93-31726
IONIZATION CHAMBERS
Characterisation of a protection level Am-241 calibration source
[NPL-RSA(EXT)-35] p 3819 N93-31335
IONIZATION POTENTIALS
Energetic particle observations and the abundances of elements in the solar corona p 3878 N93-31410
First ionization potential fractionation
p 3878 N93-31411
Effects of hydrogen and electron diffusion on trace species diffusion in the solar atmosphere
p 3878 N93-31413
IONIZED GASES
Infrared multiple photon dissociation spectra of gaseous ions
[AD-A264378] p 3821 N93-32032
IONIZING RADIATION
Chemical effects of ionizing radiations and electron beam in polymers: Industrial uses
[DE93-609337] p 3708 N93-31179
IONOSPHERES
Momentum transport through the chromosphere
p 3852 N93-31677
Distinct ion population in the polar cusp: Possible signature of transient reconnection
p 3766 N93-31680
IONOSPHERIC DISTURBANCES
An investigation of methods for improving models of ionospheric plasma-density irregularities and radio-frequency scintillation
[AD-A264156] p 3756 N93-31062
The effects of magnetic storm phases on F-layer irregularities from auroral to equatorial latitudes
[AD-A264908] p 3764 N93-32094
IONS
Interaction of solar wind ions with thin carbon foils: Calibration of time-of-flight spectrometers
p 3880 N93-31423
IRON
Carbon diffusion in uncoated and titanium nitride coated iron substrates during microwave plasma assisted chemical vapor deposition of diamond
[DE93-608934] p 3708 N93-31174
The fate of iron on Mars: Mechanism of oxidation of basaltic minerals to ferric-bearing assemblages
p 3862 N93-31938
IRON OXIDES
The mineralogy and formation processes of Mars soil
p 3861 N93-31934
Martian weathering/alteration scenarios from spectral studies of ferric and ferrous minerals
p 3862 N93-31935
Low-temperature formation of magnetic iron oxides
p 3863 N93-31946
IRRADIATION
Laser-assisted chemical vapor deposition of InN on Si(100)
[AD-A264266] p 3731 N93-31095
Investigation of carbon near the graphite-diamond-liquid triple point
[DE93-609052] p 3708 N93-31178
Characterisation of a protection level Am-241 calibration source
[NPL-RSA(EXT)-35] p 3819 N93-31335
Electron-microscopic investigations of irradiated and naturally aged aluminum alloy
[DE93-606752] p 3706 N93-31660
Utilization of high energy electron beam in the treatment of drinking and waste water
[DE92-642335] p 3783 N93-32406
ISOMERS
The effect of alkyl substituents on the macrocycle ring on enantiomeric recognition by chiral pyridino-18-crown-6 for 1-naphthylethylamine
[AD-A265513] p 3704 N93-31918
ISOMORPHISM
Beyond data parallelism: The advantages of multiple parallelizations in combinatorial search
[AD-A265008] p 3796 N93-32080
ISOTOPIC LABELING
Implications of isotopic compositions of N and Ne in the Martian atmosphere to temporal evolution of its atmosphere and regolith p 3864 N93-31947
ISOTROPIC MEDIA
Biharmonic pattern selection
[DE93-608186] p 3803 N93-31303
Some aspects of invariant theory in plasticity. Part 2: Constitutive relations for perfectly locking materials. Comments on perfectly plastic solids
p 3742 N93-32321
ISRAELI SPACE PROGRAM
The Israel Space Agency 1993 p 3883 N93-31590
ITERATION
Iterated quantifiers
[LP-92-13] p 3806 N93-31534
Determination of design and operation parameters for upper atmospheric research instrumentation to yield optimum resolution with deconvolution, appendix 3
[NASA-CR-192835] p 3766 N93-32231
Estimating the spatial extent of attractors of iterated function systems
[AD-A265856] p 3809 N93-32315
ITERATIVE SOLUTION
Iterative equation solving techniques in boundary element analysis p 3802 N93-31141
Termination criteria for GMRES-like methods to solve the discretized incompressible Navier-Stokes equations
[REPT-92-50] p 3724 N93-31484
On waveform multigrid method
[NASA-CR-191455] p 3808 N93-31843
Determination of design and operation parameters for upper atmospheric research instrumentation to yield optimum resolution with deconvolution, appendix 3
[NASA-CR-192835] p 3766 N93-32231
Finite-dimensional approximation for operator equations of Hammerstein type
[DE93-619669] p 3809 N93-32286
IUE
Calibration of ORFEUS echelle spectrometer
[ETN-93-94201] p 3691 N93-31048
Spectral classification with the International Ultraviolet Explorer: An atlas of B-type spectra
[NASA-RP-1312] p 3861 N93-31737

J

JACOBI MATRIX METHOD
Parallel Jacobi iteration in implicit step-by-step methods
[CWI-NM-R9218] p 3810 N93-32394
JAPAN
Annual report of the National Institute of Radiological Sciences
[DE93-704237] p 3820 N93-31810
JET AIRCRAFT NOISE
Engine exhaust characteristics evaluation in support of aircraft acoustic testing
[NASA-TM-104263] p 3682 N93-32220
Control of jet noise
[NASA-CR-193552] p 3816 N93-32221
The prediction of noise from co-axial jets
[ISVR-TR-215] p 3817 N93-32339
JET ENGINES
Initial results from the NASA-Lewis wave rotor experiment
[NASA-TM-106148] p 3683 N93-32368
JET EXHAUST
An experimental study of under-expanded jets
[OUEL-1959/92] p 3722 N93-31124
JET FLOW
An experimental study of under-expanded jets
[OUEL-1959/92] p 3722 N93-31124
Time accurate simulations of compressible shear flows
[NASA-CR-193410] p 3728 N93-32371
JET LAG
The effects of an antijet lag diet p 3781 N93-32263
JET MIXING FLOW
Streamwise vorticity generation and mixing enhancement in free jets by delta-tabs
[NASA-TM-106235] p 3672 N93-31648
Enhanced mixing of a rectangular supersonic jet by natural and induced screech
[NASA-TM-106245] p 3672 N93-31672
The prediction of noise from co-axial jets
[ISVR-TR-215] p 3817 N93-32339
Time accurate simulations of compressible shear flows
[NASA-CR-193410] p 3728 N93-32371
JET PROPULSION
Engine technology challenges for a 21st Century High-Speed Civil Transport
[NASA-TM-106216] p 3681 N93-31671
JOSEPHSON JUNCTIONS
High temperature superconducting films and multilayers for electronics
[AD-A264410] p 3828 N93-31190
Homoclinic twist bifurcations with Z2 symmetry
[W-9215] p 3807 N93-31627
JP-4 JET FUEL
Making clean gasoline: The effect on jet fuels
[AD-A264302] p 3713 N93-32085
JP-8 JET FUEL
Making clean gasoline: The effect on jet fuels
[AD-A264302] p 3713 N93-32085

K

K-EPSILON TURBULENCE MODEL
Numerical simulation of the flow in a 1:57-scale axisymmetric model of a large blast simulator
[AD-A265551] p 3685 N93-31916
A rapid-distortion-theory turbulence model for developed unsteady wall-bounded flow
[NASA-TM-106249] p 3727 N93-32199
A critical comparison of several low Reynolds number k-epsilon turbulence models for flow over a backward facing step
[NASA-TM-106173] p 3809 N93-32200
KALMAN FILTERS
Estimation and control in discrete-time nonlinear systems p 3797 N93-31071
Tracking filters for precision Electronic Support Measures (ESM) systems
[AD-A264089] p 3719 N93-31085
KELVIN-HELMHOLTZ INSTABILITY
Plasma transport through magnetic boundaries
p 3827 N93-31692
KERNEL FUNCTIONS
Some new results for chain-sequence polynomials
[MEMO-1081] p 3806 N93-31515
KINETIC ENERGY
Mass, momentum and energy transport from the Sun to the Earth by different types of the solar wind: Prognoz 7 observations p 3857 N93-31705
Development of practical MO techniques for prediction of the properties and behavior of materials
[AD-A265730] p 3820 N93-31798
Navier-Stokes computations for kinetic energy projectiles in steady coning motion: A predictive capability for pitch damping
[AD-A264111] p 3726 N93-32028
Technique for measuring the spin rate of kinetic energy projectiles
[AD-A264114] p 3717 N93-32031
KINETICS
Intuitive approach to modified gyrokinetic equation and numerical confirmation
[DE93-604671] p 3812 N93-31083
The aircraft position tests: A computer generated process for acquisition of spatial orientation capability
p 3776 N93-31236
Kinetics of adsorption from liquid phase on activated carbon
[ETN-93-94042] p 3703 N93-31521
Investigation of trap emission kinetics MOS capacitors using a pump-probe charge integrating technique
[AD-A265198] p 3721 N93-31994
KNOWLEDGE BASED SYSTEMS
An intelligent knowledge system for selection of materials for critical aerospace applications (IKSMAT), phase 2
[AD-A263394] p 3835 N93-31078
Knowledge-based framework for an automated user interface presentation design tool p 3836 N93-31135
Temporal and spatial analysis in knowledge-based physics problem-solving p 3814 N93-31651
Creating a structured knowledge base by parsing natural language text p 3839 N93-31854
Knowledge-based software development tools
[AD-A265218] p 3791 N93-32059
Implementing a real time reasoning system for robust diagnosis p 3739 N93-32138
Knowledge based document retrieval in office environments: The Kabiria system
[REPT-92-032] p 3843 N93-32389
Initial definition of a Knowledge-Based Software Quality Assistant
[AD-A265866] p 3793 N93-32418

KNOWLEDGE BASES (ARTIFICIAL INTELLIGENCE)
Probabilistic load simulation: Code development status p 3694 N93-31564
Expert system development for probabilistic load simulation p 3695 N93-31570
Creating a structured knowledge base by parsing natural language text p 3839 N93-31854
Advanced Artificial Intelligence Technology Testbed p 3801 N93-32126
Knowledge-based simulation using object-oriented programming p 3794 N93-32127
The Knowledge-Based Software Assistant: Beyond CASE p 3794 N93-32156
KNOWLEDGE REPRESENTATION
DIAC at TWI
[REPT-92-77] p 3787 N93-31472
Meeting some neighbours: A dynamic modal logic meets theories of change and knowledge representation
[LP-92-10] p 3806 N93-31531
Knowledge-based simulation using object-oriented programming p 3794 N93-32127
KOLMOGOROV THEORY
Spectra and structure functions of temperature fluctuations in the inner solar wind p 3860 N93-31720
KRYPTON
Isotopically selective detection of rubidium in krypton
[ETN-93-94051] p 3703 N93-31630
KRYPTON ISOTOPES
Excitation rate and background measurements during LIF studies on krypton
[DE93-013500] p 3732 N93-32304
KRYPTON 85
Excitation rate and background measurements during LIF studies on krypton
[DE93-013500] p 3732 N93-32304

L

LABORATORIES
Calibration system for testing laboratory
[VTT-TIED-1401] p 3738 N93-31172
Newly available technologies present expanding opportunities for scientific and technical information exchange p 3837 N93-31217
National Media Laboratory: Media testing results p 3840 N93-31972
Advanced Artificial Intelligence Technology Testbed p 3801 N93-32126
LAGRANGIAN FUNCTION
Real-time trajectory optimization on parallel processors
[NASA-CR-193303] p 3795 N93-31640
LAMINAR BOUNDARY LAYER
Effects of an aft facing step on the surface of a laminar flow glider wing
[NASA-CR-193302] p 3673 N93-31855
LAMINAR FLOW
Numerical simulations of three-dimensional laminar flow over a backward facing step; flow near side walls
[NASA-TM-106248] p 3723 N93-31147
Effects of an aft facing step on the surface of a laminar flow glider wing
[NASA-CR-193302] p 3673 N93-31855
Selected experiments in laminar flow: An annotated bibliography
[NASA-TM-103989] p 3673 N93-32226
LAMINATES
Measurement of the out-of-plane shear response of thick section composite materials using the v-notched beam specimen
[AD-A264898] p 3699 N93-31065
Impact response of laminated plates subjected to transverse loading p 3740 N93-31645
Design of multiple-ply laminated composite tapered beams
[NASA-TM-108411] p 3700 N93-31650
GARTEUR compression behaviour of advanced CFRP
[NLR-TP-91290-U] p 3701 N93-32202
LAND ICE
The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop
[NASA-CP-3222] p 3758 N93-31878
Macrofossil records of West Antarctic Ice Sheet retreat during the Holocene p 3759 N93-31881
The diatom record from beneath the West Antarctic Ice Sheet and the global proxy perspective p 3759 N93-31882
Reconnaissance and deep-drill site selection on Taylor Dome, Antarctica p 3759 N93-31883
Velocities of Thwaites and Land glaciers p 3760 N93-31885
Condition of the Ross Ice Shelf derived from AVHRR imagery p 3760 N93-31886
SPOT satellite mapping of Ice Stream B p 3760 N93-31887
The mass balance of the ice plain of Ice Stream B and Crary Ice Rise p 3760 N93-31888
Surface velocity fields of Ice Streams D and E derived from repeat satellite imagery p 3760 N93-31890
The role of the margins in ice stream dynamics p 3761 N93-31896
Thermal control of ice-stream margins p 3762 N93-31897
In search of ice-stream sticky spots p 3762 N93-31899
Geologic controls on the West Antarctic Ice Sheet p 3762 N93-31900
Effect of subglacial volcanism on changes in the West Antarctic Ice Sheet p 3762 N93-31901
Sensible and latent heat flux estimates in Antarctica p 3763 N93-31902
Modeling ice streams: Derived quantities p 3763 N93-31904
LAND MANAGEMENT
Monitoring vegetation greenness with satellite data
[PB93-190882] p 3744 N93-31213
Remote sensing: A powerful aid for the analysis of problems in the north Holland Vechtstreek
[ETN-93-93468] p 3747 N93-32344
LAND USE
Maglev guideway route alignment and right-of-way requirements
[PB93-154854] p 3735 N93-31592
Indigenous views of land and the environment
[PB93-186898] p 3755 N93-32166
Land subsidence and problems affecting land use at Edwards Air Force Base and vicinity, California, 1990
[PB93-182236] p 3765 N93-32191
Satellite pictures: An efficient aid for information about land use
[ETN-93-93467] p 3747 N93-32343
LANDAU DAMPING
The dynamics and stability of weak double layers
[TRITA-ALP-92-02] p 3825 N93-31626
LANDAU FACTOR
Electronic Landau levels in quantum wells with periodically structured interfaces
[DE93-608514] p 3828 N93-31664
LANDAU-GINZBURG EQUATIONS
The constraint for the lowest Landau level and the effective field theory approach for the fractional quantum hall system
[DE93-608200] p 3831 N93-31509
LANDSAT SATELLITES
Recent acceleration of Thwaites Glacier p 3761 N93-31893
Remotely sensed data from space. Distribution, pricing, and applications: An OTA background paper
[PB93-176964] p 3747 N93-32309
LANGUAGE PROGRAMMING
A query language for spatial data p 3745 N93-31261
Managing semantic heterogeneity with production rules and persistent queues
[REPT-92-078] p 3811 N93-31464
Deriving incremental production rules for deductive data
[REPT-92-081] p 3787 N93-31466
LANGUAGES
Z through pictures
[RSRE-MEMO-4587] p 3787 N93-31337
Kohonen feature maps in natural language processing
[CL-91-01] p 3788 N93-31517
LAPLACE TRANSFORMATION
Perturbation of the Laplacian by the Coulomb potential and a point interaction in L(sup p)(R cubed)
[REPT-92-55] p 3807 N93-31613
LARGE SPACE STRUCTURES
Automated assembly of large space structures using an expert system executive p 3690 N93-32102
Stanford Aerospace Research Laboratory research overview p 3690 N93-32103
LASER APPLICATIONS
Investigation of carbon near the graphite-diamond-liquid triple point
[DE93-609052] p 3708 N93-31178
Rayleigh-Brillouin scattering for high-pressure gas temperature measurements p 3693 N93-31556
High resolution imaging from the ground using a satellite-borne laser guide star p 3849 N93-31781
The optical response of a double quantum well driven by two lasers: Localization and low frequency generation
[AD-A265118] p 3819 N93-31792
Space qualification for an intersatellite laser communications system
[AD-A265145] p 3717 N93-31989
The application of synthetic-beacon technology to astronomy
[AD-A265146] p 3850 N93-31990
Optically guided laser wakefield acceleration
[AD-A265441] p 3732 N93-32019
Report of the working group on far field accelerators
[AD-A265443] p 3732 N93-32021
The applicability and availability of Former Soviet Union (FSU) space-related capabilities and facilities to energy-related space activities of Department of Energy, Department of Defense and National Aeronautics and Space Administration
[DE93-010286] p 3686 N93-32178
LASER BEAMS
Mathematical inversion of multiple-scattering of laser light
[DE93-609128] p 3803 N93-31224
Cerenkov type phase-matched second harmonic generation in polymeric channel waveguides
[AD-A265787] p 3710 N93-31801
The application of synthetic-beacon technology to astronomy
[AD-A265146] p 3850 N93-31990
Optically guided laser wakefield acceleration
[AD-A265441] p 3732 N93-32019
LASER CUTTING
Cutting parameters with Lasag lasers
[DE93-010403] p 3732 N93-32288
LASER DAMAGE
Investigation of laser-induced retinal damage
[AD-A264096] p 3772 N93-31094
LASER DOPPLER VELOCIMETERS
Contribution to the experimental and theoretical study of vortex breakdown
[ONERA-NT-1990-12] p 3724 N93-31477
LASER INDUCED FLUORESCENCE
Isotopically selective detection of rubidium in krypton
[ETN-93-94051] p 3703 N93-31630
Study on laser atomic spectroscopy
[DE93-606193] p 3703 N93-31824
Applications of optical fiber to remote laser fluorescence analysis
[DE93-607553] p 3732 N93-31826
Excitation rate and background measurements during LIF studies on krypton
[DE93-013500] p 3732 N93-32304
Investigation of PACVD protective coating processes using advanced diagnostics techniques
[DE93-013978] p 3711 N93-32307
LASER MODES
Mode hopping in semiconductor lasers p 3731 N93-31131
LASER OUTPUTS
Laser-assisted chemical vapor deposition of InN on Si(100)
[AD-A264266] p 3731 N93-31095
Mode hopping in semiconductor lasers p 3731 N93-31131
Effects of atomic coherence on multi-level lasing systems p 3731 N93-31133
The conditions leading to intense low frequency generation and strong localization in two level systems
[AD-A265110] p 3819 N93-31791
Cerenkov type phase-matched second harmonic generation in polymeric channel waveguides
[AD-A265787] p 3710 N93-31801
Optically guided laser wakefield acceleration
[AD-A265441] p 3732 N93-32019
Optical and kinetic processes in excimer lasers
[AD-A264210] p 3733 N93-32402
LASER PLASMAS
Optically guided laser wakefield acceleration
[AD-A265441] p 3732 N93-32019
Radiative preheat in strongly coupled, laser accelerated plasmas
[AD-A265442] p 3826 N93-32020
LASER RANGE FINDERS
Conception of a modular real-time system for laser remote sensing with particular consideration of upward compatibility
[SER-C-378] p 3731 N93-31340
LASER RANGER/TRACKER
Ground- and satellite-derived flight-path measurements as demonstrated in the AFES Avionics Flight Evaluation System (AFES) p 3677 N93-31281
LASER SPECTROSCOPY
Study on laser atomic spectroscopy
[DE93-606193] p 3703 N93-31824
LASER TARGET INTERACTIONS
Radiative preheat in strongly coupled, laser accelerated plasmas
[AD-A265442] p 3826 N93-32020
LASER TARGETS
Radiative preheat in strongly coupled, laser accelerated plasmas
[AD-A265442] p 3826 N93-32020
LASERS
Laser-assisted chemical vapor deposition of InN on Si(100)
[AD-A264266] p 3731 N93-31095

Effects of atomic coherence on multi-level lasing systems p 3731 N93-31133

LASING
Effects of atomic coherence on multi-level lasing systems p 3731 N93-31133

LATENT HEAT
Sensible and latent heat flux estimates in Antarctica p 3763 N93-31902

LATERAL CONTROL
Experiments in the control of wing rock at high angle of attack using tangential leading edge blowing p 3683 N93-31068

LATTICES (MATHEMATICS)
TDLM: A Transonic Doublet Lattice Method for 3D potential unsteady transonic flow calculation [DLR-FB-92-25] p 3671 N93-31171

LAUNCHERS
Evaluation of future space transportation systems with regard to their reliability and costs [ESA-TT-1281] p 3687 N93-31593

LAUNCHING
A survey of codes for modeling electromagnetic launch [AD-A264946] p 3687 N93-32074

LAUNCHING BASES
Fire protection for launch facilities using machine vision fire detection p 3687 N93-32113

LAVA
The application of remotely sensed data to studies of volcanism within the Galapagos Islands p 3747 N93-32326

LAY-UP
Design of multiple-ply laminated composite tapered beams [NASA-TM-108411] p 3700 N93-31650

LEAD ALLOYS
Local order and concentration fluctuations in K-Pb and Rb-Pb alloys [DE93-606725] p 3704 N93-31093

LEAD COMPOUNDS
Hierarchical textures in ferroelectric crystals [DE93-608938] p 3827 N93-31175

LEADING EDGES
Experiments in the control of wing rock at high angle of attack using tangential leading edge blowing p 3683 N93-31068
Effect of sound on boundary layer stability [NASA-CR-193367] p 3816 N93-32238

LEAKAGE
Flammability and explosion limits of H2 and H2/CO: A literature review [AD-A264896] p 3702 N93-31064

LEARNING
An annotated bibliography of inductive learning since 1985 [REPT-92-74] p 3833 N93-31507

LEARNING THEORY
An annotated bibliography of inductive learning since 1985 [REPT-92-74] p 3833 N93-31507

LEAST SQUARES METHOD
Least squares orthogonal polynomial approximation in several independent variables [DE93-609832] p 3802 N93-31180
RLS techniques with generalized forgetting devices for the identification of time-varying systems [REPT-92-069] p 3810 N93-31463
An analysis of the composition of auroral emissions in the near infrared [AD-A265493] p 3764 N93-32009
Set-membership identification for robust control design [AD-A265669] p 3800 N93-32197
Adaptive RLS identification with generalized forgetting techniques [REPT-92-037] p 3810 N93-32390

LENSES
Upgrade of the LIMDAS day/night whole sky imager [AD-A265871] p 3769 N93-32171

LEPTONS
Lepton-quark families, cosmic strings and democratic mass matrix [DE93-608263] p 3832 N93-31809

LIBRARIES
Integrated access to distributed databases through intelligent interfaces p 3837 N93-31218
End users: New products and services p 3837 N93-31220
The management of change: Implications for the information professional p 3838 N93-31222
Modernization and new technologies: Coping with the information explosion [NASA-TM-109410] p 3838 N93-31315
Software to model AXAF image quality [NASA-CR-192574] p 3789 N93-31637
Performance of a distributed superscalar storage server p 3841 N93-31978
Automation and hypermedia technology applications p 3843 N93-32155

LIE GROUPS
Normal forms of invariant vector fields under a finite group action [DE93-604134] p 3813 N93-31102
BRST quantization of 2D-Yang Mills theory with anomalies [NIKHEF-H/92-13] p 3831 N93-31122
Q-deformed conformal superalgebra and its Hopf subalgebras [DE93-608160] p 3807 N93-31808
Supersymmetric construction of W-algebras from super Toda and WZNW theories [DE93-608244] p 3808 N93-31819
Lie bialgebras with triangular decomposition [DE93-604232] p 3808 N93-31820
On two-current realization of KP hierarchy [DE93-609917] p 3808 N93-31912

LIFE (DURABILITY)
Examination of the effect of propulsion system performance variables on the life prediction for the SSME Lox Post p 3697 N93-31580
Life extending control: An interdisciplinary engineering thrust p 3697 N93-31581

LIFE SCIENCES
Spontaneous regulating mechanisms that may have led to the origin of life [DE93-603677] p 3771 N93-31161
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 377) [NASA-SP-7011(377)] p 3773 N93-31924

LIFE SUPPORT SYSTEMS
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 377) [NASA-SP-7011(377)] p 3773 N93-31924
Attention focussing and anomaly detection in real-time systems monitoring p 3730 N93-32139
Microbiological test results of the environmental control and life support systems vapors compression distillation subsystem recycle tank components following various pretreatment protocols [NASA-CR-192570] p 3772 N93-32354
Optimization of 15 parameters influencing the long-term survival of bacteria in aquatic systems [NASA-CR-192571] p 3772 N93-32365

LIFTING BODIES
Panel methods for aerodynamic analysis and design [NLR-TP-91404-U] p 3674 N93-32357

LIFTING REENTRY VEHICLES
The X-15/HL-20 operations support comparison [NASA-TM-4453] p 3687 N93-32379

LIGANDS
The effect of alkyl substituents on the macrocycle ring on enantiomeric recognition by chiral pyridino-18-crown-6 for 1-naphthylethylamine [AD-A265513] p 3704 N93-31918

LIGHT ALLOYS
NASA-UVa light aerospace alloy and structure technology program supplement: Aluminum-based materials for high speed aircraft [NASA-CR-4517] p 3705 N93-31643
NASA-UVA Light Aerospace Alloy and Structures Technology Program (LA2ST) [NASA-CR-193412] p 3706 N93-31739

LIGHT CURVE
Periodic x ray flares of NGC 6814: Gravitational lensing of an accreting neutron star? [DE92-642586] p 3851 N93-31073

LIGHT IONS
Nuclear structure effects in elastic and inelastic scattering of light ions [DE93-616909] p 3822 N93-32407

LIGHT MODULATION
Multi-quantum well lateral-field-effect electro-refraction modulator [AD-A264411] p 3729 N93-31191
Design of coupled mace filters for optical pattern recognition using practical spatial light modulators [NASA-CR-193192] p 3823 N93-31841
Quantum well optical waveguide modulators [AD-A265421] p 3824 N93-32050

LIGHT SCATTERING
Scattering by irregular particles in anomalous diffraction and discrete dipole approximations p 3817 N93-31154
Rayleigh-Brillouin scattering for high-pressure gas temperature measurements p 3693 N93-31556
Imaging circumstellar disks around young stars by multi-aperture interferometry p 3847 N93-31766
Pressure induced topological phase transitions in membranes [AD-A265212] p 3829 N93-32002

LIGHT SOURCES
Proceedings of the Workshop on Application of Circularly Polarized X Rays in the Region of 1 to 8 keV [DE93-704276] p 3823 N93-31165
Adaptive optics for high power beam lines using diamond crystal monochromators [DE93-009328] p 3824 N93-31987

LIGHT TRANSMISSION
Development of technical processes for manufacturing heavy metal fluoride glass fibers [ETN-93-94200] p 3707 N93-31047

LIGHTNING
Experimental evaluation of an arrival time difference lightning positioning system [KNMI-WR-92-01] p 3767 N93-31600

LIMITS (MATHEMATICS)
Existence and uniqueness of limit cycles for a special system of differential equations on the plane [REPT-92-63] p 3806 N93-31550

LINE OF SIGHT
Eclipse observations of the outer solar corona and the SOHO mission p 3872 N93-31371

LINE SPECTRA
Calibration of ORFEUS echelle spectrometer [ETN-93-94201] p 3691 N93-31048
Frequency of the chemical elements in B-stars of the local field and dispersion of interstellar medium [ETN-93-94205] p 3852 N93-31091
The coronal diagnostic spectrometer for the Solar and Heliospheric Observatory p 3868 N93-31347
Ground-based coronagraphic observations of solar streamers p 3870 N93-31358
On the Fabry-Perot investigations of the solar corona: Eclipse observations of the green line intensities and half widths p 3872 N93-31375
Quiet and active solar structures as observed at the bottom of the transition region p 3874 N93-31382
A comparison of the dynamical signatures of coronal heating mechanisms p 3875 N93-31394
General properties of the polarization of the Fe 14 5303 A coronal emission line p 3877 N93-31404
A diagnostic method for reconnecting magnetic fields in the solar corona p 3877 N93-31406
Atomic and molecular line observations of galaxies p 3847 N93-31771
Submillimetre line observations of molecular clouds p 3848 N93-31772

LINEAR ACCELERATORS
Report of the working group on far field accelerators [AD-A265443] p 3732 N93-32021

LINEAR OPERATORS
The linear quadratic digital control of infinite-dimensional systems with unbounded input and output operators [REPT-92-49] p 3798 N93-31483
Perturbation of the Laplacian by the Coulomb potential and a point interaction in L(sup p)(R cubed) [REPT-92-55] p 3807 N93-31613

LINEAR PROGRAMMING
Symposium on Applied Mathematical Programming and Modeling (APMOD93): Volume of extended abstracts [AD-A264091] p 3784 N93-31087
An extended algorithm for performance evaluation of timed event graphs [REPT-92-75] p 3787 N93-31474
Primal-dual algorithms for linear programming based on the logarithmic barrier method [REPT-92-104] p 3790 N93-31659

LINEAR QUADRATIC GAUSSIAN CONTROL
Optimal fixed-finite-dimensional compensator for Burgers' equation with unbounded input/output operators [NASA-CR-191454] p 3808 N93-31857

LINEAR QUADRATIC REGULATOR
The linear quadratic digital control of infinite-dimensional systems with unbounded input and output operators [REPT-92-49] p 3798 N93-31483

LINEAR SYSTEMS
Disturbance decoupling by measurement feedback for structured systems: A graph theoretical approach [REPT-92-53] p 3805 N93-31487
The generic dimension of a minimal realization of an AR-system [REPT-92-82] p 3805 N93-31492
Analytic system problems and J-lossless factorization for infinite-dimensional linear systems [W-9218] p 3798 N93-31513
Interactions between magnetically levitated vehicles and elevated guideway structures [PB93-148542] p 3736 N93-32192

LINEARIZATION
Normal forms of invariant vector fields under a finite group action [DE93-604134] p 3813 N93-31102
Robust stability of second-order systems [NASA-CR-193624] p 3809 N93-32373

Nonlinear disturbance decoupling and linearization: A partial interpretation of integral feedback
[MEMO-1093] p 3801 N93-32400

LINGUISTICS
Automating multilingual communication
p 3837 N93-31219
A formal discourse grammar tackling verb phrase anaphora
[CL-91-03] p 3787 N93-31478
Kohonen feature maps in natural language processing
[CL-91-01] p 3788 N93-31517
Connectionist models and linguistic theory: Investigations of stress systems in language
[AD-A265450] p 3777 N93-32064

LININGS
Reusable cryogenic liquid rocket propellant tank
[NASA-CASE-LAR-14172-1] p 3692 N93-31295

LIPID METABOLISM
Lipodystrophies in the French military flight crew
p 3774 N93-32249

LIPIDS
Pressure induced topological phase transitions in membranes
[AD-A265212] p 3829 N93-32002
Blood lipids in aircrew recruits and in RAF aviators
p 3774 N93-32251
Objective improvements obtained by control of diet and physical training in Spanish Air Force fighter pilots
p 3780 N93-32258
The influence of dietary counseling and cardiac catheterization on lipid profiles in American military aviators p 3781 N93-32259

LIPOPROTEINS
Results and management of pathological lipoprotein concentrations and other cardiovascular risk factors in military pilots of the German Federal Armed Forces
p 3775 N93-32254

LIQUEFIED GASES
Cost-effectiveness analysis of txDOT LPG fleet conversion, volume 1
[PB93-186492] p 3712 N93-31326
Cost-effectiveness analysis of txDOT LPG fleet conversion, volume 2
[PB93-186500] p 3713 N93-31327

LIQUEFIED NATURAL GAS
Environment and safety research
[PB93-188860] p 3751 N93-31142
LNG as a fuel for railroads: Assessment of technology status and economics
[PB93-188787] p 3713 N93-31434

LIQUID CHROMATOGRAPHY
Innovative instrument design and applications in super-critical fluid chromatography and extraction
p 3704 N93-32327

LIQUID CRYSTALS
Liquid-crystalline main-chain polymers with flexible side chains: Synthesis, structure, processing and properties of poly(p-phenylene terephthalate)s with alkoxy side chains
[ETN-93-94041] p 3709 N93-31520
Pressure induced topological phase transitions in membranes
[AD-A265212] p 3829 N93-32002
Liquid-crystal heat valve controlled with multiple electrode pairs
[AD-D015739] p 3830 N93-32211

LIQUID FILLED SHELLS
Reusable cryogenic liquid rocket propellant tank
[NASA-CASE-LAR-14172-1] p 3692 N93-31295

LIQUID NITROGEN
High temperature superconductivity: Concept, preparation and testing of high T(sub c) superconductor compounds and applications
[DE93-608696] p 3827 N93-31077

LIQUID PHASES
Kinetics of adsorption from liquid phase on activated carbon
[ETN-93-94042] p 3703 N93-31521

LIQUID PROPELLANT ROCKET ENGINES
Radiation/convection coupling in rocket motor and plume analysis
[NASA-CR-193288] p 3698 N93-31845

LITHIUM ALLOYS
Accelerated and real-time corrosion testing of aluminum-lithium alloys
[NLR-TP-91203-U] p 3707 N93-32385

LITHIUM COMPOUNDS
Thermal stability of lithiated vanadium oxide (LVO), gamma-lithium vanadium bronze (gamma-LiV2O5) and vanadium dioxide (VO2) thermal battery cathode materials
[RAE-TR-92047] p 3722 N93-32422

LITHOGRAPHY
Low voltage electron beam lithography
[AD-A263360] p 3719 N93-31080

LITHOLOGY
Lithology and chronology of ice-sheet fluctuations (magnetic susceptibility of cores from the western Ross Sea) p 3759 N93-31880

LOAD CARRYING CAPACITY
Buckling and postbuckling of stiffened thin skinned carbon fibre composite panels
[ATN-9301] p 3742 N93-32331

LOAD DISTRIBUTION (FORCES)
Probabilistic load simulation: Code development status
p 3694 N93-31564
Expert system development for probabilistic load simulation p 3695 N93-31570

LOAD TESTS
High cycle fatigue of glass fibre reinforced epoxy materials for wind turbines
[DLR-FB-92-17] p 3700 N93-31461
Conclusions and recommendations
p 3682 N93-31749

LOADS (FORCES)
AGARD Engine Disc Cooperative Test Programme
[AGARD-R-766-ADD] p 3681 N93-31741
Fatigue crack growth results for Ti-6Al-4V, IMI 685, and Ti-17 p 3682 N93-31746

LOCOMOTION
Melatonin, the pineal gland, and circadian rhythms
[AD-A264099] p 3772 N93-31061

LOGIC CIRCUITS
Pulse-modulated control of switching valves for an electro-hydraulic servo actuator
[DLR-FB-92-18] p 3719 N93-31462

LOGIC DESIGN
Fuzzy Control/Space Station automation
p 3688 N93-31440
Terminology and concepts of control and Fuzzy Logic
p 3688 N93-31443
Overview of Fuzzy Logic p 3688 N93-31445
Blowdown thrust profile prediction
p 3689 N93-31448
Path planning control p 3685 N93-31451
Hyperbaric treatment p 3689 N93-31454
Design and implementation of fuzzy logic controllers
[NASA-CR-193268] p 3784 N93-31649

LOGIC PROGRAMMING
On the integration of algebraic and logic languages
[ETN-93-94238] p 3786 N93-31205
Deriving incremental production rules for deductive data
[REPT-92-081] p 3787 N93-31466
Reasoning about termination of PROLOG programs
[CT-91-12] p 3787 N93-31479
Weak equivalence: Theory and applications
[CT-92-02] p 3788 N93-31529
A new definition of SLDNF-resolution
[CT-92-03] p 3806 N93-31530
VDM specification of the Secure Hash algorithm
[NPL-DITC-212/92] p 3790 N93-31735
Revision by expansion in logic programs
[REPT-93-02] p 3790 N93-31852
Knowledge-based simulation using object-oriented programming p 3794 N93-32127
Agent oriented programming: An overview of the framework and summary of recent research
p 3794 N93-32136

LOGISTICS
RACE pulls for shared control p 3686 N93-32122

LONG WAVE RADIATION
The conditions leading to intense low frequency generation and strong localization in two level systems
[AD-A265110] p 3819 N93-31791

LORENTZ FORCE
Relativistic band gaps in one-dimensional disordered systems
[DE93-609841] p 3829 N93-31814
Benet improvements made on Los Alamos electromagnetic field code
[AD-A265474] p 3718 N93-32065

LOSSES
Initial results from the NASA-Lewis wave rotor experiment
[NASA-TM-106148] p 3683 N93-32368

LOW COST
Low cost guideways to Maglev
[PB93-154847] p 3735 N93-31727
Potential low-cost telerobotics flight experiments
p 3737 N93-32120

LOW FREQUENCIES
The conditions leading to intense low frequency generation and strong localization in two level systems
[AD-A265110] p 3819 N93-31791
The optical response of a double quantum well driven by two lasers: Localization and low frequency generation
[AD-A265118] p 3819 N93-31792

LOW REYNOLDS NUMBER
A critical comparison of several low Reynolds number k-epsilon turbulence models for flow over a backward facing step
[NASA-TM-106173] p 3809 N93-32200
Turbulence and transition modeling for high-speed flows
[NASA-CR-191473] p 3727 N93-32329

LOW TEMPERATURE
Numerical studies of low temperature gallium arsenide buffer layers and their influence on device operation
[AD-A264296] p 3829 N93-32083

LOW VOLTAGE
Low voltage electron beam lithography
[AD-A263360] p 3719 N93-31080

LUBRICANT TESTS
Lubrication of an 85-mm ball bearing with RP-1
[NASA-TM-106254] p 3686 N93-31670

LUBRICANTS
Chemical and thermal stability of refrigerant-lubricant mixtures with metals
[DE93-013082] p 3715 N93-32163
Materials compatibility and lubricants research on CFC-refrigerant substitutes
[DE93-014770] p 3711 N93-32292
Solubility, viscosity and density of refrigerant/lubricant mixtures
[DE93-014771] p 3711 N93-32293
Tribological characteristics of perfluoropolyether liquid lubricants under sliding conditions in high vacuum
[NASA-TM-106257] p 3711 N93-32352

LUBRICATING OILS
Tribological characteristics of perfluoropolyether liquid lubricants under sliding conditions in high vacuum
[NASA-TM-106257] p 3711 N93-32352

LUBRICATION
Lubrication of an 85-mm ball bearing with RP-1
[NASA-TM-106254] p 3686 N93-31670

LUNAR BASED EQUIPMENT
Interferometry from the Moon p 3845 N93-31757
The lunar interferometer for solar physics
p 3847 N93-31768
Advanced lunar-based interferometer for solar observations p 3847 N93-31769

LUNAR EXPLORATION
RATLER: Robotic All-Terrain Lunar Exploration Rover
p 3737 N93-32117

LUNAR OBSERVATORIES
SeaWiFS technical report series. Volume 10: Modeling of the SeaWiFS solar and lunar observations
[NASA-TM-104566-VOL-10] p 3770 N93-31859

LUNAR ROVING VEHICLES
RATLER: Robotic All-Terrain Lunar Exploration Rover
p 3737 N93-32117

LUNAR SURFACE
RATLER: Robotic All-Terrain Lunar Exploration Rover
p 3737 N93-32117

LYMAN ALPHA RADIATION
SWAN: A study of solar wind anisotropies
p 3868 N93-31351
Predicting Ly-alpha intensities in coronal streamers
p 3870 N93-31360
Ly-alpha radiation from coronal transients
p 3870 N93-31363
Interplanetary hydrogen gas as a monitor of the Sun's corpuscular and radiative output p 3878 N93-31412
Measuring electron temperature in the extended corona p 3880 N93-31422

M

MACH NUMBER
Supersonic aerodynamic characteristics of an advanced F-16 derivative aircraft configuration
[NASA-TP-3355] p 3673 N93-31733

MACHINE LEARNING
Optimization of adaptive resonance theory network with boltzmann machine
[PB93-188134] p 3797 N93-31332
Kohonen feature maps in natural language processing
[CL-91-01] p 3788 N93-31517
Connectionist models and linguistic theory: Investigations of stress systems in language
[AD-A265450] p 3777 N93-32064
Using machine learning techniques to automate sky survey catalog generation p 3843 N93-32143
A neural network approach to seismic phase identification
[DE93-013601] p 3800 N93-32305

MACHINE TRANSLATION
Automating multilingual communication
p 3837 N93-31219

MAGNETIC BEARINGS
A study on the development of high T(sub c) superconducting materials
[DE93-606394] p 3720 N93-31825
Large angle magnetic suspension test fixture
[NASA-CR-193123] p 3684 N93-31836
Design and application of Active Magnetic Bearings (AMB) for vibration control p 3738 N93-32279
MAGNETIC CLOUDS
Model of a rotating magnetic cloud
p 3857 N93-31707
MAGNETIC DISKS
Goddard Conference on Mass Storage Systems and Technologies, volume 2
[NASA-CP-3198-VOL-2] p 3839 N93-31964
Ultra-high density recording technologies
p 3840 N93-31971
Data storage: Retrospective and prospective
p 3841 N93-31976
MAGNETIC DISTURBANCES
Retardation effects and the origin of filament oscillations p 3853 N93-31679
MAGNETIC EFFECTS
Electromagnetic response of a superconducting wire of finite length in a perpendicular applied AC magnetic field
[MEMO-1087] p 3716 N93-31516
MAGNETIC FIELD CONFIGURATIONS
Diagnostics of magnetic substorms using satellite observations of magnetic pulsations
[AD-A264300] p 3764 N93-32084
MAGNETIC FIELD INVERSIONS
Two and three dimensional magnetotelluric inversion
[DE93-013233] p 3765 N93-32165
MAGNETIC FIELD RECONNECTION
Theory of coronal streamer formation
p 3869 N93-31355
Multi-thermal emission associated with a limb prominence following two subflares and a coronal mass ejection p 3876 N93-31399
A diagnostic method for reconnecting magnetic fields in the solar corona p 3877 N93-31406
Study of the Solar-Terrestrial System
[ESA-SP-346] p 3852 N93-31674
Reconnection in the solar corona
p 3855 N93-31695
Magnetic field reconnection at the dayside magnetopause p 3855 N93-31696
Time-varying reconnection in a stagnation-point flow geometry p 3827 N93-31697
Collisionless magnetotail reconnection and substorms
p 3856 N93-31698
A study of the magnetic field annihilation process in the magnetosphere and some geotechnical applications
[DE93-013172] p 3765 N93-32164
MAGNETIC FIELDS
Are there missing convective currents?
[DE93-604672] p 3825 N93-31084
Low aperture magnetic elements measurements
[DE93-605897] p 3814 N93-31088
New edge magnetoplasmon for a two-dimensional electron gas in a ring geometry
[DE93-608737] p 3825 N93-31164
Quantum adiabatic expansion for dynamics in strong magnetic fields
[DE93-609388] p 3831 N93-31226
Distinct ion population in the polar cusp: Possible signature of transient reconnection
p 3766 N93-31680
Quasi-parallel shock re-formation: Two-dimensional simulations p 3826 N93-31682
A new method for measuring the speed of the bow shock p 3854 N93-31687
Reconnection in the solar corona
p 3855 N93-31695
Magnetic field reconnection at the dayside magnetopause p 3855 N93-31696
Observation of particle bursts in the tail of planet Mars onboard the Phobos 2 spacecraft p 3856 N93-31699
Auroral Cluster: Science objectives and measurement strategies p 3858 N93-31710
Diagnostics of magnetic substorms using satellite observations of magnetic pulsations
[AD-A264300] p 3764 N93-32084
Investigation of transitions from order to chaos in dynamical systems
[DE93-014437] p 3833 N93-32290
The PIT MkV pulsed inductive thruster
[NASA-CR-191155] p 3698 N93-32353
MAGNETIC FLUX
Tokamak plasma shape identification based on the boundary integral equations
[DE93-715383] p 3825 N93-31097
MAGNETIC LEVITATION VEHICLES
Maglev guideway route alignment and right-of-way requirements
[PB93-154854] p 3735 N93-31592
Low cost guideways to Maglev
[PB93-154847] p 3735 N93-31727
Maglev guideway and route integrity requirements
[PB93-154870] p 3736 N93-32086
Interactions between magnetically levitated vehicles and elevated guideway structures
[PB93-148542] p 3736 N93-32192
Noise from high speed maglev systems: Noise sources, noise criteria, preliminary design guidelines for noise control, and recommendations for acoustical test facility for maglev research
[PB93-154896] p 3736 N93-32193
Maglev program test plan
[PB93-154904] p 3736 N93-32194
MAGNETIC MATERIALS
Fundamental studies of new high-energy permanent magnet materials
[DE93-014707] p 3815 N93-32291
MAGNETIC MEASUREMENT
Low aperture magnetic elements measurements
[DE93-605897] p 3814 N93-31088
SQUIDs in thermal detectors of weakly interacting particles
[DE93-609531] p 3729 N93-31247
Low-temperature formation of magnetic iron oxides
p 3863 N93-31946
MAGNETIC MOMENTS
A 17 keV neutrino and large magnetic moment solution of the solar neutrino puzzle
[DE93-608264] p 3819 N93-31662
Novel spin effects in quantum chromodynamics
[DE93-010955] p 3833 N93-32181
MAGNETIC PERMEABILITY
High temperature superconductivity: Concept, preparation and testing of high T(sub c) superconductor compounds and applications
[DE93-608696] p 3827 N93-31077
Lithology and chronology of ice-sheet fluctuations (magnetic susceptibility of cores from the western Ross Sea) p 3759 N93-31880
MAGNETIC PROPERTIES
On Short Large Amplitude Magnetic Structures in the vicinity of the quasi-parallel region of the Earth's bow shock p 3854 N93-31688
Location of nanophase Fe-oxides in palagonitic soils: Implication for Martian pigments p 3863 N93-31943
Effect of DCB extraction on Mossbauer and spectral data for a Hawaiian palagonitic soil (PN-9): Iden tification of pigmentary phases p 3864 N93-31950
Physical characterization and study of the electrical magnetic and thermal properties of the ceramic high Tc superconductor Y1Ba2Cu3O(7-x)
[DE92-640219] p 3711 N93-32187
Fundamental studies of new high-energy permanent magnet materials
[DE93-014707] p 3815 N93-32291
MAGNETIC RECORDING
Data storage: Retrospective and prospective
p 3841 N93-31976
MAGNETIC SIGNATURES
Active region studies with coordinated SOHO, microwave, and magnetograph observations
p 3873 N93-31380
MAGNETIC STORMS
Collisionless magnetotail reconnection and substorms
p 3856 N93-31698
On the solar wind-magnetosphere-ionosphere coupling: AMPTE/CCE particle data and the AE indices
p 3856 N93-31701
Solar wind penetration to geostationary altitude during the March 1991 magnetic storm p 3857 N93-31706
Diagnostics of magnetic substorms using satellite observations of magnetic pulsations
[AD-A264300] p 3764 N93-32084
The effects of magnetic storm phases on F-layer irregularities from auroral to equatorial latitudes
[AD-A264908] p 3764 N93-32094
MAGNETIC SURVEYS
Two and three dimensional magnetotelluric inversion
[DE93-013233] p 3765 N93-32165
MAGNETIC SUSPENSION
Large angle magnetic suspension test fixture
[NASA-CR-193123] p 3684 N93-31836
Noise from high speed maglev systems: Noise sources, noise criteria, preliminary design guidelines for noise control, and recommendations for acoustical test facility for maglev research
[PB93-154896] p 3736 N93-32193
Maglev program test plan
[PB93-154904] p 3736 N93-32194
A decoupled control approach for magnetic suspension systems using electromagnets mounted in a planar array
[NASA-TM-109011] p 3715 N93-32227
MAGNETIC TAPES
Goddard Conference on Mass Storage Systems and Technologies, volume 2
[NASA-CP-3198-VOL-2] p 3839 N93-31964
The standards process: Technical committee X3B5 digital magnetic tape p 3840 N93-31967
Recording and wear characteristics of 4 and 8 mm helical scan tapes p 3730 N93-31969
Striped tape arrays p 3730 N93-31970
Ultra-high density recording technologies
p 3840 N93-31971
National Media Laboratory: Media testing results
p 3840 N93-31972
Data storage: Retrospective and prospective
p 3841 N93-31976
The redwood project: An overview
p 3841 N93-31979
MAGNETIC VARIATIONS
Diagnostics of magnetic substorms using satellite observations of magnetic pulsations
[AD-A264300] p 3764 N93-32084
Interactions between magnetically levitated vehicles and elevated guideway structures
[PB93-148542] p 3736 N93-32192
MAGNETO-OPTICS
Goddard Conference on Mass Storage Systems and Technologies, volume 2
[NASA-CP-3198-VOL-2] p 3839 N93-31964
Ultra-high density recording technologies
p 3840 N93-31971
MAGNETOACTIVITY
On the Bernstein modes generation in solar post-flare loops p 3859 N93-31718
MAGNETOHYDRODYNAMIC FLOW
What can we learn from the shape of loops?
p 3874 N93-31386
Energetics of ULF/ELF plasma waves in the solar wind and outer Earth's magnetosphere p 3826 N93-31689
Time-varying reconnection in a stagnation-point flow geometry p 3827 N93-31697
Magnetospheric convection and current system in the dayside polar cap p 3856 N93-31700
MAGNETOHYDRODYNAMIC STABILITY
The dynamics and stability of weak double layers
[TRITA-ALP-92-02] p 3825 N93-31626
Microinstabilities in high-power MPD systems: Preliminary diagnostics
[AD-A265415] p 3826 N93-32047
MAGNETOHYDRODYNAMIC TURBULENCE
Solar coronal magnetic structure
p 3852 N93-31676
MAGNETOHYDRODYNAMIC WAVES
A comparison of the dynamical signatures of coronal heating mechanisms p 3875 N93-31394
Coronal heating: The role of resonant absorption
p 3876 N93-31396
Momentum transport through the chromosphere
p 3852 N93-31677
Retardation effects and the origin of filament oscillations p 3853 N93-31679
Coronal shock waves p 3853 N93-31681
Ion acceleration at parallel shocks: Self-consistent plasma simulations p 3826 N93-31683
Nonlinear interaction of Alfven waves in solar atmosphere p 3860 N93-31724
MAGNETOHYDRODYNAMICS
Modeling solar coronal streamers
p 3869 N93-31356
Temperature dependent morphology of untwisted coronal loops p 3875 N93-31393
Reconnection in the solar corona
p 3855 N93-31695
Mass, momentum and energy transport from the Sun to the Earth by different types of the solar wind: Prognoz 7 observations p 3857 N93-31705
Mirror mode and other compressive ULF modes
p 3719 N93-31711
MAGNETOHYDROSTATICS
Fast computation of magnetohydrostatic equilibria using Euler potentials and multigrid methods
p 3877 N93-31401
MAGNETOMETERS
Low aperture magnetic elements measurements
[DE93-605897] p 3814 N93-31088
Diagnostics of magnetic substorms using satellite observations of magnetic pulsations
[AD-A264300] p 3764 N93-32084
MAGNETOPAUSE
Plasma transport through magnetic boundaries
p 3827 N93-31692
Can ULF fluctuations observed at the magnetopause play a role in anomalous diffusion?
p 3855 N93-31693
Exploring the magnetospheric boundary layer
p 3855 N93-31694

Magnetic field reconnection at the dayside magnetopause p 3855 N93-31696
Role of the INTERBALL small scale investigations in the GGS program p 3859 N93-31717

MAGNETOPLASMADYNAMICS
Microinstabilities in high-power MPD systems: Preliminary diagnostics
[AD-A265415] p 3826 N93-32047

MAGNETORESISTIVITY
On the magnetoresistance of heavy fermion compounds
[DE93-608691] p 3827 N93-31098

MAGNETOSHEATH
The structure of the dayside boundary layer between the Venus ionosphere and the shocked solar wind p 3853 N93-31678
Energetic particles (greater than 34 KeV - 3.2 MeV) in the deep Martian magnetotail (X = 15.5 R(sub M)), modeling of the Martian bow shock and the influence of low solar wind pressure on Mars as an obstacle p 3855 N93-31691

MAGNETOSPHERE-IONOSPHERE COUPLING
On the solar wind-magnetosphere-ionosphere coupling: AMPTE/CCE particle data and the AE indices p 3856 N93-31701
Role of the INTERBALL small scale investigations in the GGS program p 3859 N93-31717

MAGNETOSPHERES
Investigation of fine-scale aurora with the Freja electric field instrument p 3860 N93-31719

MAGNETOSPHERIC INSTABILITY
Collisionless magnetotail reconnection and substorms p 3856 N93-31698

MAGNETOSPHERIC ION DENSITY
On the solar wind-magnetosphere-ionosphere coupling: AMPTE/CCE particle data and the AE indices p 3856 N93-31701

MAGNETOSTATICS
A magnetostatic coronal model with horizontal electric currents: Modeling the coronal streamer belt p 3871 N93-31366

MAINTAINABILITY
Enhanced methods for determining operational capabilities and support costs of proposed space systems
[NASA-CR-193265] p 3812 N93-32350

MAINTENANCE
Long-term reliability of gas pipeline repairs by reinforced composites. Annual report, July 1991-June 1992
[PB93-188647] p 3700 N93-31334
Applying MORT maintenance safety analysis in Finnish industry
[VTT-TIED-1332] p 3714 N93-31545
Research platforms FLIP and ORB support
[AD-A265910] p 3771 N93-32320

MAINTENANCE TRAINING
Investigation of advanced technology for airway facilities maintenance training
[DOT/FAA/CT-TN92/24] p 3678 N93-32336

MAMMALS
Neurophysiological analysis of circadian rhythm entrainment
[AD-A264681] p 3774 N93-32018

MAN MACHINE SYSTEMS
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 377)
[NASA-SP-7011(377)] p 3773 N93-31924
Accessing Earth science data from the EOS data and information system p 3840 N93-31968
The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992)
[NASA-CP-3187-VOL-1] p 3883 N93-32097
Man-machine cooperation in advanced teleoperation p 3784 N93-32106
Integration of advanced teleoperation technologies for control of space robots p 3784 N93-32107
Interactive and cooperative sensing and control for advanced teleoperation p 3784 N93-32108
Air Force research in human sensory feedback for telepresence p 3801 N93-32109

MAN-COMPUTER INTERFACE
Knowledge-based framework for an automated user interface presentation design tool p 3836 N93-31135
Assessment of a human computer interface prototyping environment
[NASA-CR-192612] p 3784 N93-31849
Accessing Earth science data from the EOS data and information system p 3840 N93-31968
System engineering concept demonstration, interface standards studies, volume 4
[AD-A265470] p 3791 N93-32024
An iconic programming language for sensor-based robots p 3793 N93-32098
Information for the user in design of intelligent systems p 3801 N93-32149
Cooperative answers in database systems p 3843 N93-32153

MANAGEMENT INFORMATION SYSTEMS
Information systems strategies for public financial management
[PB93-186948] p 3842 N93-32167
Knowledge based document retrieval in office environments: The Kabiria system
[REPT-92-032] p 3843 N93-32389

MANAGEMENT METHODS
The management of change: Implications for the information professional p 3838 N93-31222
NASA Engineering and Technology Advancement Office: A proposal to the administrator
[NASA-TM-109229] p 3685 N93-31312
Applying MORT maintenance safety analysis in Finnish industry
[VTT-TIED-1332] p 3714 N93-31545
Strategic management: Managing change by managing participation
[AD-A265796] p 3834 N93-32311

MANAGEMENT PLANNING
NASA Engineering and Technology Advancement Office: A proposal to the administrator
[NASA-TM-109229] p 3685 N93-31312
Strategic management: Managing change by managing participation
[AD-A265796] p 3834 N93-32311

MANAGEMENT SYSTEMS
Strategic management: Managing change by managing participation
[AD-A265796] p 3834 N93-32311

MANEUVERABILITY
Advanced aircraft with thrust vector control
[MBB-FE-1-S-PUB-0504] p 3678 N93-31043

MANIFOLDS (MATHEMATICS)
On global bifurcations caused by the unfolding of a homoclinic orbit
[W-9221] p 3806 N93-31524
Lie bialgebras with triangular decomposition
[DE93-604232] p 3808 N93-31820

MANIPULATORS
Automated assembly of large space structures using an expert system executive p 3690 N93-32102
Stanford Aerospace Research Laboratory research overview p 3690 N93-32103
Man-machine cooperation in advanced teleoperation p 3784 N93-32106
Interactive and cooperative sensing and control for advanced teleoperation p 3784 N93-32108
TeleOperator/telePresence System (TOPS) Concept Verification Model (CVM) development p 3784 N93-32112
On the design of fault-tolerant robotic manipulator systems p 3737 N93-32125
Constrained motion models for insertion/extraction operations applied to the Hermes robot arm: A feasibility study
[NLR-TP-91485-U] p 3736 N93-32204
Modified dynamics modelling for maneuvering flexible space manipulators
[NLR-TP-91280-U] p 3737 N93-32333
Robust stability of second-order systems
[NASA-CR-193624] p 3809 N93-32373

MANNED MARS MISSIONS
NASA's progress in nuclear electric propulsion technology
[NASA-TM-106272] p 3698 N93-31858

MANPOWER
Selection of personnel for stressful occupations: The potential utility of psychophysiological measures as selection tools
[AD-A264571] p 3776 N93-32011

MANUAL CONTROL
Supervisory autonomous local-remote control system design: Near-term and far-term applications p 3801 N93-32100

MANUALS
Manual for data administration
[PB93-182053] p 3834 N93-31431
TSCA confidential business information security manual
[PB93-184844] p 3839 N93-31833
Tropical cyclone forecasters reference guide, No. 3: Tropical cyclone formation
[AD-A265216] p 3768 N93-32005

MANUFACTURING
Electropneumatic actuator, phase 1
[PB93-174951] p 3720 N93-31876
The technology base for agile manufacturing p 3715 N93-32104
Large-area, triple-junction a-Si alloy production scale-up
[DE93-010007] p 3750 N93-32177
Buckling and postbuckling of stiffened thin skinned carbon fibre composite panels
[ATN-9301] p 3742 N93-32331

MANY BODY PROBLEM
The Lipkin model second order phase transition in the deformed su(2) algebra description
[DE93-608201] p 3807 N93-31661

MAPPING
GDF: A digitizing format for geographical data p 3744 N93-31260
Code vector density in topographic mappings
[RSRE-MEMO-4669] p 3746 N93-31611

MAPS
Aerial cartography using SICAD NAV-AIR p 3744 N93-31258

MAPSAT
Reports on Cartography and Topography, series 1, report no. 103
[ETN-90-97325] p 3744 N93-31256

MARINE BIOLOGY
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 3: Appendices
[PB93-186088] p 3771 N93-32308

MARINE ENVIRONMENTS
Modeling studies of ice-ocean dynamics and thermodynamics
[AD-A264084] p 3769 N93-31082
Variability of temperature and salinity in the Middle Atlantic Bight and Gulf of Maine
[PB93-174019] p 3769 N93-31591
Research platforms FLIP and ORB support
[AD-A265910] p 3771 N93-32320

MARINE METEOROLOGY
Navy tactical applications guide, part 2, volume 8: Arctic-East Siberian/Chukchi/Beaufort Seas. Weather analysis and forecast applications
[AD-A265585] p 3768 N93-31922

MARINE PROPULSION
On the verification of a theory for sculling propulsion
[ETN-93-94040] p 3725 N93-31519

MARKETING
Coordination of production and sales
[ETN-93-94039] p 3834 N93-31518

MARKOV PROCESSES
A generalized asymptoticity problem in max algebra, the general case
[REPT-92-76] p 3804 N93-31471
Regularity of stochastic processes: A theory based on directional convexity
[REPT-92-70] p 3811 N93-31503
A segmental hidden Markov model for speech pattern processing
[RSRE-MEMO-4599] p 3716 N93-31610
Automatic specification of reliability models for fault-tolerant computers
[NASA-TP-3301] p 3812 N93-31869
Modeling and inference for transient tracers on oceanic flow
[AD-A265428] p 3770 N93-32037

MARS (PLANET)
Energetic particles (greater than 34 KeV - 3.2 MeV) in the deep Martian magnetotail (X = 15.5 R(sub M)), modeling of the Martian bow shock and the influence of low solar wind pressure on Mars as an obstacle p 3855 N93-31691
Observation of particle bursts in the tail of planet Mars onboard the Phobos 2 spacecraft p 3856 N93-31699
Martian weathering/alteration scenarios from spectral studies of ferric and ferrous minerals p 3862 N93-31935
Effect of DCB extraction on Mossbauer and spectral data for a Hawaiian palagonitic soil (PN-9): Iden tification of pigmentary phases p 3864 N93-31950
Chemical transport during formation and alteration of Martian impact and volcanic deposits p 3865 N93-31953
The Martian ocean: First acid, then alkaline p 3866 N93-31958
Geochemistry and setting of Martian weathering: The Lafayette meteorite p 3866 N93-31961

MARS ATMOSPHERE
MSATT Workshop on Chemical Weathering on Mars
[NASA-CR-193209] p 3861 N93-31933
Implications for volcanogenic volatile release on the weathering of Mars p 3862 N93-31939
Calculated mineral precipitation upon evaporation of a model Martian groundwater near 0 C p 3862 N93-31940
Implications of isotopic compositions of N and Ne in the Martian atmosphere to temporal evolution of its atmosphere and regolith p 3864 N93-31947
Mars brine formation experiment p 3864 N93-31949
Experimental investigation of carbonate formation on Mars p 3866 N93-31959

MARS ENVIRONMENT
Effects of the chemical environment on the spectroscopic properties of clays: Applications for Mars p 3862 N93-31936
Effect of purity on adsorption capacities of a Mars-like clay mineral at different pressures p 3863 N93-31945
Mars brine formation experiment p 3864 N93-31949
Chemical modeling constraints on Martian surface mineralogies formed in an early, warm, wet climate, and speculations on the occurrence of phosphate minerals in the Martian regolith p 3865 N93-31956
The Martian ocean: First acid, then alkaline p 3866 N93-31958
Chemical reactivity of the Martian soil p 3867 N93-31963

MARS PHOTOGRAPHS
An unusual spectral unit in West Candor Chasma: Evidence for hydrothermal or aqueous alteration? p 3863 N93-31942

MARS SURFACE
MSATT Workshop on Chemical Weathering on Mars [NASA-CR-193209] p 3861 N93-31933
The mineralogy and formation processes of Mars soil p 3861 N93-31934
Martian weathering/alteration scenarios from spectral studies of ferric and ferrous minerals p 3862 N93-31935
Effects of the chemical environment on the spectroscopic properties of clays: Applications for Mars p 3862 N93-31936
Dehydroxylated clay silicates on Mars: Riddles about the Martian regolith solved with ferrian saponites p 3862 N93-31937
The fate of iron on Mars: Mechanism of oxidation of basaltic minerals to ferric-bearing assemblages p 3862 N93-31938
Implications for volcanogenic volatile release on the weathering of Mars p 3862 N93-31939
On the weathering of Martian igneous rocks p 3862 N93-31941
An unusual spectral unit in West Candor Chasma: Evidence for hydrothermal or aqueous alteration? p 3863 N93-31942
Location of nanophase Fe-oxides in palagonitic soils: Implication for Martian pigments p 3863 N93-31943
Aqueous geochemistry on Mars: Possible clues from salts and clays in SNC meteorites p 3863 N93-31944
Effect of purity on adsorption capacities of a Mars-like clay mineral at different pressures p 3863 N93-31945
Low-temperature formation of magnetic iron oxides p 3863 N93-31946
Preliminary results of an experimental study of the interactions of basalt glass and a water vapor atmosphere: Implications for weathering on Mars p 3864 N93-31948
Effect of DCB extraction on Mossbauer and spectral data for a Hawaiian palagonitic soil (PN-9): Iden tification of pigmentary phases p 3864 N93-31950
Systematic variations in the spectral properties of bright regions on Mars p 3864 N93-31951
Composition of weakly altered Martian crust: Clues from imaging spectroscopy p 3865 N93-31952
Chemical transport during formation and alteration of Martian impact and volcanic deposits p 3865 N93-31953
Reflectance spectroscopy and GEX simulation of palagonite and iron-rich montmorillonite clay mixtures: Implications for the surface composition of Mars p 3865 N93-31954
Using the Viking biology experimental results to obtain chemical information about Martian regolith p 3865 N93-31955
Chemical modeling constraints on Martian surface mineralogies formed in an early, warm, wet climate, and speculations on the occurrence of phosphate minerals in the Martian regolith p 3865 N93-31956
Infrared optical properties of Mars soil analog materials: Palagonites p 3866 N93-31957
The Martian ocean: First acid, then alkaline p 3866 N93-31958
Experimental investigation of carbonate formation on Mars p 3866 N93-31959
Weathering processes implied from analysis of small Martian avalanche chutes p 3866 N93-31960
Attempts to comprehend Martian surface processes through interpretation of the oxygen isotopic compositions of carbonates in SNC meteorites p 3867 N93-31962
Chemical reactivity of the Martian soil p 3867 N93-31963

MARS VOLCANOES
Implications for volcanogenic volatile release on the weathering of Mars p 3862 N93-31939

MARSHLANDS
Florida's estuaries: A citizen's guide to coastal living and conservation [PB93-189330] p 3751 N93-31113

MASKING
Auditory spectro-temporal pattern analysis [AD-A264691] p 3773 N93-31981

MASS
Surveillance schemes with applications to mass calibration [PB93-181881] p 3810 N93-31430
A universal mass in (2+1)-dimensions [DE93-609888] p 3832 N93-31911

MASS BALANCE
Mass balance assessment using GPS p 3761 N93-31892

MASS DISTRIBUTION
The mass balance of the ice plain of Ice Stream B and Crary Ice Rise p 3760 N93-31888
Radar studies of the West Antarctic ice streams p 3760 N93-31891

MASS FLOW
Thermal control of ice-stream margins p 3762 N93-31897
Modeling and inference for transient tracers on oceanic flow [AD-A265428] p 3770 N93-32037

MASS SPECTRA
Calibration of a detector system for solar energetic particles analysis p 3860 N93-31721

MASS SPECTROMETERS
Solar wind abundances from Ulysses p 3878 N93-31409

MASS SPECTROSCOPY
Interaction of solar wind ions with thin carbon foils: Calibration of time-of-flight spectrometers p 3880 N93-31423
Cyclocarbon coalescence: Mechanisms for tailormade fullerene formation [AD-A265489] p 3821 N93-31995

MASS TRANSFER
Mass, momentum and energy transport from the Sun to the Earth by different types of the solar wind: Prognoz 7 observations p 3857 N93-31705
Modeling and inference for transient tracers on oceanic flow [AD-A265428] p 3770 N93-32037

MASSIVELY PARALLEL PROCESSORS
Evaluating master-slave implementation of double-dot parsing for massive parallel MIMD systems [REPT-92-78] p 3794 N93-31473
Generalized steady-state, applied to 2-D, 3-D massively parallel computing [REPT-92-71] p 3795 N93-31504
Experiences with different parallel programming paradigms for Monte Carlo particle transport leads to a portable toolkit for parallel Monte Carlo [DE93-009061] p 3796 N93-31986
Massively parallel support for a case-based planning system p 3797 N93-32135

MATERIALS
Standard Reference Materials: Handbook for SRM users [PB93-183796] p 3699 N93-31830

MATERIALS HANDLING
Prometheus in space: Survey report of Research Committee on Functional New Material p 3710 N93-31728

MATERIALS RECOVERY
Projects within the Center for Advanced Materials [PB93-175222] p 3699 N93-31870

MATERIALS SCIENCE
Projects within the Center for Advanced Materials [PB93-175222] p 3699 N93-31870

MATHEMATICAL LOGIC
Integration and implementation of the automated natural deduction in demonstrators using resolution [ETN-93-94239] p 3803 N93-31208
Workshop on Fuzzy Control Systems and Space Station Applications [NASA-CR-193202] p 3688 N93-31439
Undecidability of modal and intermediate first-order logics with two individual variables [ML-92-06] p 3804 N93-31480
Realizability [ML-92-09] p 3804 N93-31482
Weak equivalence: Theory and applications [CT-92-02] p 3788 N93-31529
Meeting some neighbours: A dynamic modal logic meets theories of change and knowledge representation [LP-92-10] p 3806 N93-31531
A note on dynamic arrow logic [LP-92-11] p 3788 N93-31532
Sequent calculi for normal modal propositional logics [LP-92-12] p 3806 N93-31533
Iterated quantifiers [LP-92-13] p 3806 N93-31534
Generic modal resolution [REPT-92-90] p 3807 N93-31635

MATHEMATICAL MODELS
A method to predict the orbital lifetimes of free tethers and tether-trailing satellites using artificial neural networks p 3687 N93-31069
Periodic x ray flares of NGC 6814: Gravitational lensing of an accreting neutron star? [DE92-642586] p 3851 N93-31073
Overall properties of composite materials: A general model based on periodic microstructure p 3699 N93-31143
Digital processing for positioning with one satellite [ETN-93-93732] p 3685 N93-31318
Viscosities of molten slags [NPL-DMM(A)-55] p 3705 N93-31321
Modeling solar coronal streamers p 3869 N93-31356
Predicting Ly-alpha intensities in coronal streamers p 3870 N93-31360
Observational constraints on coronal hole density model p 3871 N93-31364
A magnetostatic coronal model with horizontal electric currents: Modeling the coronal streamer belt p 3871 N93-31366
Static and dynamic loop models and their observational signatures p 3873 N93-31377
The prominence-corona interface: Models and observations p 3873 N93-31378
The physics of solar prominences p 3874 N93-31383
Mass motion of a heated plasma blob in a coronal loop p 3874 N93-31384
Radiative modeling of solar prominences, two-dimensional transfer plus partial frequency redistribution p 3875 N93-31389
Temperature dependent morphology of untwisted coronal loops p 3875 N93-31393
Evolution and oscillations of coronal loops p 3876 N93-31395
Coronal heating: The role of resonant absorption p 3876 N93-31396
Temperature measurements in the inner corona p 3877 N93-31402
Observational tests of coronal heating models p 3877 N93-31403
Modeling industrial distributed control systems with Petri nets [REPT-92-079] p 3714 N93-31465
Protection and regulation on direct-direct chopping converters [CNES-NT-129] p 3719 N93-31475
Finite volume methods constructed by mixed variational formulation. Part 2: Error estimates in discrete energetic norms [REPT-92-86] p 3805 N93-31488
Finite volume methods constructed by mixed variational formulation. Part 1: Description of the discretization technique [REPT-92-85] p 3805 N93-31489
Tidally averaged models for dispersion in shallow water [REPT-92-66] p 3769 N93-31497
Generalized steady-state, applied to 2-D, 3-D massively parallel computing [REPT-92-71] p 3795 N93-31504
The development of a ring model for the study of tire in-plane dynamics [MEMT-20] p 3734 N93-31508
On the verification of a theory for sculling propulsion [ETN-93-94040] p 3725 N93-31519
Kinetics of adsorption from liquid phase on activated carbon [ETN-93-94042] p 3703 N93-31521
Web crippling of cold-formed steel members [ISBN-9-03-860122-0] p 3705 N93-31540
Overview of the fatigue/fracture/life prediction working group program at the Lewis Research Center p 3696 N93-31574
Constitutive and damage material modeling in a high pressure hydrogen environment p 3696 N93-31577
A model for predicting high-temperature fatigue failure of a W/Cu composite p 3696 N93-31579
On the Chebyshev collocation approximation and domain decomposition [FFI-92/7032] p 3807 N93-31598
Homoclinic twist bifurcations with Z2 symmetry [W-9215] p 3807 N93-31627
Analysis of effective thermal conductivity of fibrous materials [NASA-CR-193242] p 3709 N93-31636
Software to model AXAF image quality [NASA-CR-192574] p 3789 N93-31637

Reconnection in the solar corona
p 3855 N93-31695
Time-varying reconnection in a stagnation-point flow geometry
p 3827 N93-31697
Nonlinear interaction of Alfven waves in solar atmosphere
p 3860 N93-31724
Crack growth prediction models
p 3682 N93-31747
Crack growth prediction results
p 3682 N93-31748
Large angle magnetic suspension test fixture
[NASA-CR-193123] p 3684 N93-31836
On the quantitative interpretation of uranium series disequilibria
[VTT-TIED-1404] p 3821 N93-31863
Numerical methods for inverse problems in three-dimensional geophysical modeling, phase 2
[PB93-181584] p 3758 N93-31872
Modeling ice streams: Derived quantities
p 3763 N93-31904
Navy tactical applications guide, part 2, volume 8: Arctic-East Siberian/Chukchi/Beaufort Seas. Weather analysis and forecast applications
[AD-A265585] p 3768 N93-31922
An analysis of the composition of auroral emissions in the near infrared
[AD-A265493] p 3764 N93-32009
A mechanics model for the compressive response of fiber reinforced composites
[AD-A265556] p 3701 N93-32067
A survey of codes for modeling electromagnetic launch
[AD-A264946] p 3687 N93-32074
Infinite volume extrapolations of finite cluster calculations. How correct are these?
[AD-A265648] p 3809 N93-32170
Source apportionment of air pollution in China: Extending the usefulness of receptor modeling by combining multivariate and chemical mass balance models
[PB93-185726] p 3756 N93-32188
Numerical modelling of mesoscale atmospheric dispersion, volumes 1 and 2
p 3765 N93-32217
Effect of sound on boundary layer stability
[NASA-CR-193367] p 3816 N93-32238
On the superconductivity existence within the Hubbard model
[DE93-613987] p 3830 N93-32280
Modeling of optical waveguide biosensor structures
[VTT-PUBS-112] p 3824 N93-32421

MATHEMATICAL PROGRAMMING
Symposium on Applied Mathematical Programming and Modeling (APMOD93): Volume of extended abstracts
[AD-A264091] p 3784 N93-31087

MATRICES (MATHEMATICS)
Iterative equation solving techniques in boundary element analysis
p 3802 N93-31141
Building Hadamard matrices in steps of 4 to order 200
[PB93-189835] p 3786 N93-31200
A generalized asymptoticity problem in max algebra, the general case
[REPT-92-76] p 3804 N93-31471
Isocliny, Souillart matrices, quaternions and four-dimensional rotations
[REPT-92-57] p 3813 N93-31502
Necessary and sufficient conditions for J-spectral factorizations with a J-lossless property for infinite-dimensional systems in continuous and discrete time
[W-9217] p 3798 N93-31512
Graph theoretic methods for the computation of disturbance decoupling feedback matrices for structured systems
[REPT-92-54] p 3789 N93-31614
Three lectures on quantum groups: Representations, duality, real forms
[DE93-608159] p 3832 N93-31807
Linear algebra for signal processing
[AD-A264677] p 3808 N93-32017
On the real symmetric inverse eigenvalue problem
[DE93-619667] p 3809 N93-32284

MATRIX MATERIALS
The development of a tungsten heavy alloy that fails by an adiabatic shear mechanism, phase 1
[AD-A265867] p 3707 N93-32318

MATTER (PHYSICS)
Three-neutrino oscillations in matter and topological phases
[DE93-608386] p 3813 N93-31290

MAXIMUM ENTROPY METHOD
Information-theoretic and Wigner function approaches to the nonclassical states dynamics for the variable frequency harmonic oscillator
[DE93-608166] p 3813 N93-31301

MAXIMUM LIKELIHOOD ESTIMATES
Digital processing for positioning with one satellite
[ETN-93-93732] p 3685 N93-31318
Trellis coded modulation applied to orthogonal signals
[AD-A265232] p 3717 N93-32060

MAXIMUM PRINCIPLE
Optimal control problems for parabolic boundary control systems
p 3800 N93-32216

MAXWELL EQUATION
A generalization of Dirac non-linear electrodynamics, and spinning charged particles
[DE93-609847] p 3821 N93-31907
Free Maxwell equations, Dirac equation, and non-dispersive De Broglie wave packets
[DE93-609848] p 3832 N93-31908

MCMURDO SOUND
Macrofossil records of West Antarctic Ice Sheet retreat during the Holocene
p 3759 N93-31881

MEASURING INSTRUMENTS
Calibration system for testing laboratory
[VTT-TIED-1401] p 3738 N93-31172
The basic measurement equipment of the DLR test aircraft
p 3675 N93-31273
The NPL reference hazemeter
[NPL-QU-94] p 3729 N93-31325
The Charge, Element, and Isotope Analysis System CELIAS on SOHO
p 3869 N93-31352
COSTEP: Comprehensive suprathermal and energetic particle analyser for SOHO: Scientific goals and data description
p 3869 N93-31353
Progress in the measurement of SSME turbine heat flux with plug-type sensors
p 3692 N93-31553
Thin film heat flux sensor for Space Shuttle Main Engine turbine environment
p 3693 N93-31554
Thin film thermocouples for high temperature turbine application
p 3693 N93-31555
An integrated eddy current detection and imaging system on a silicon chip
p 3693 N93-31560
Heat transfer and pressure measurements for the SSME fuel turbine
p 3698 N93-31587
Auroral Cluster: Science objectives and measurement strategies
p 3858 N93-31710
CELIAS: Charge, Element and Isotope Analysis System for the SOHO mission
p 3860 N93-31725
Surface roughness measuring systems
[VTT-TIED-1392] p 3748 N93-32420

MECHANICAL DEVICES
Automated failure mode effects and criticality analyses for reliability prediction of multibody mechanical systems
p 3738 N93-31107
Service equipment for use in hostile environments
[NASA-CASE-LEW-14906-2] p 3734 N93-31314

MECHANICAL PROPERTIES
Computer simulation of 3D material microstructure and its application in the determination of mechanical behavior of polycrystalline materials and engineering structures
p 3708 N93-31134
Use of titanium castings without a casting factor
[AD-A264414] p 3705 N93-31192
Liquid-crystalline main-chain polymers with flexible side chains: Synthesis, structure, processing and properties of poly(p-phenylene terephthalate)s with alkoxy side chains
[ETN-93-94041] p 3709 N93-31520
Study of improved critical currents and mechanical properties in YBaCuO superconductor with Ag or 211
[AD-A265749] p 3829 N93-31804
Precipitation hardening of infrared transmitting ZnS ceramics
[AD-A265184] p 3710 N93-31993
Ceramic technology project database
[DE93-012429] p 3710 N93-32161
Proceedings of the First Geological Materials Constitutive Modeling Workshop
[DE93-009161] p 3765 N93-32176

MECHANICAL SHOCK
On the feasibility of a transient dynamic design analysis
[AD-A264882] p 3733 N93-31101

MEDICAL SCIENCE
Hyperbaric treatment
p 3689 N93-31454
An annotated bibliography of research involving women, conducted at the US Army Research Institute of Environmental Medicine
[AD-A265497] p 3773 N93-31917

MEDICAL SERVICES
Annual report of the National Institute of Radiological Sciences
[DE93-704237] p 3820 N93-31810
Health maintenance facility system effectiveness testing
[NASA-TM-104737] p 3783 N93-32328

MELANIN
Investigation of laser-induced retinal damage
[AD-A264096] p 3772 N93-31094

MELTING
Viscosities of molten slags
[NPL-DMM(A)-55] p 3705 N93-31321
Electrical conductivities of molten slags
[NPL-DMM(A)-79] p 3705 N93-31324

MELTING POINTS
The thermodynamic and structural contributions to the vacancy formation energies in hot rare gas solids
[DE93-604742] p 3827 N93-31086

MEMBRANES
Pressure induced topological phase transitions in membranes
[AD-A265212] p 3829 N93-32002

MEMORY
The test memorization of symbols and numbers: A computer generated test for visual sensitivity
p 3775 N93-31233

MEMORY (COMPUTERS)
Investigations into database management system support for expert system shells, volumes 1 and 2
p 3835 N93-31108
The performance of integrity control through transaction modification in a parallel main-memory database system
[MEMO-INF-92-54] p 3839 N93-31615
Automatic Target Recognition (ATR) using Distributed Associative Memories (DAMS)
[AD-A265613] p 3800 N93-32169
Global synchronization algorithms for the Intel iPSC/860
[NASA-CR-193618] p 3793 N93-32361

MENTAL PERFORMANCE
Computer-generated parallel tests for aptitude measurement in the selection of aviation operators
[DLR-FB-92-29] p 3775 N93-31229
Background and objectives of the PARAT program
p 3775 N93-31230
The test memorization of symbols and numbers: A computer generated test for visual sensitivity
p 3775 N93-31233
The concentration loading test system: A computer generated process for acquisition of attentiveness control
p 3776 N93-31235
The aircraft position tests: A computer generated process for acquisition of spatial orientation capability
p 3776 N93-31236
The cube rotation test: A computer generated process for acquisition of mental spatial manipulator capability
p 3776 N93-31237
The PARAT tests as examination system
p 3776 N93-31238
Effects of caffeine on mental performance and mood: Implications for aircrew members
p 3783 N93-32269

MESON-NUCLEON INTERACTIONS
Supercritical pomeron and spin effects in meson-nucleon scattering at high energy
[DE93-608327] p 3818 N93-31242
Theory of deep-inelastic scattering reactions and x-rescaling model
[DE93-604519] p 3820 N93-31821
Some outstanding issues in pion scattering at energies above the (delta) resonance
[DE93-012747] p 3822 N93-32300

MESONS
Novel spin effects in quantum chromodynamics
[DE93-010955] p 3833 N93-32181

MESOSCALE PHENOMENA
Evolution of area-averaged vertical velocity in the convective region of a midlatitude squall line
[AD-A265333] p 3768 N93-32063
Numerical modelling of mesoscale atmospheric dispersion, volumes 1 and 2
p 3765 N93-32217

MESSAGE PROCESSING
Real-time trajectory optimization on parallel processors
[NASA-CR-193303] p 3795 N93-31640
VDM specification of the Secure Hash algorithm
[NPL-DITC-212/92] p 3790 N93-31735

METABOLISM
Trial of emergency ration of the Spanish Air Force
p 3778 N93-32247

METAL FIBERS
A model for predicting high-temperature fatigue failure of a W/Cu composite
p 3696 N93-31579

METAL HYDRIDES
HREM study of crystallography of titanium and titanium hydride thin films
[DE93-609038] p 3828 N93-31176

METAL IONS
Ion exchange polymers and method for making
[NASA-CASE-LEW-15576-1] p 3709 N93-31316
Meteor impacts, sporadic E layer formation and the incoherent scatter method
[IRF-SF-210] p 3852 N93-31624

METAL MATRIX COMPOSITES
A model for predicting high-temperature fatigue failure of a W/Cu composite
p 3696 N93-31579
NASA-UVa light aerospace alloy and structure technology program supplement: Aluminum-based materials for high speed aircraft
[NASA-CR-4517] p 3705 N93-31643

Investigation of the electrochemical polarisation behaviour of SiC/6061 Al metal matrix composites
[NPL-DMM(A)-31] p 3700 N93-31736
Internal structural characterization
[AD-A264762] p 3738 N93-31982

METAL NITRIDES
Fundamental studies of new high-energy permanent magnet materials
[DE93-014707] p 3815 N93-32291

METAL OXIDE SEMICONDUCTORS
DLTS and dynamic transconductance analysis of deep-submicron fully-depleted SOI MOSFETs
[AD-A264888] p 3721 N93-31984
Investigation of trap emission kinetics MOS capacitors using a pump-probe charge integrating technique
[AD-A265198] p 3721 N93-31994

METAL SHEETS
Study on the improvement of the properties of Zr alloys
[DE93-605265] p 3706 N93-31827

METAL VAPOR LASERS
Study on laser atomic spectroscopy
[DE93-606193] p 3703 N93-31824

METALLIC GLASSES
Development of technical processes for manufacturing heavy metal fluoride glass fibers
[ETN-93-94200] p 3707 N93-31047

METALLURGY
Welding and metallurgy
[DE93-010926] p 3735 N93-31790

METALORGANIC CHEMICAL VAPOR DEPOSITION
Multi-quantum well lateral-field-effect electro-refraction modulator
[AD-A264411] p 3729 N93-31191
Surface-emitting laser-based optical switching: An update
[DE93-010689] p 3732 N93-32180

METALS
Availability of platinum and platinum-group metals
[PB93-189496] p 3743 N93-31115

METASTABLE STATE
Metastability in molecules
[AD-A264344] p 3817 N93-31063

METEORITES
Geochemistry and setting of Martian weathering: The Lafayette meteorite p 3866 N93-31961
Attempts to comprehend Martian surface processes through interpretation of the oxygen isotopic compositions of carbonates in SNC meteorites p 3867 N93-31962

METEORITIC COMPOSITION
Calculated mineral precipitation upon evaporation of a model Martian groundwater near 0 C
p 3862 N93-31940
Geochemistry and setting of Martian weathering: The Lafayette meteorite p 3866 N93-31961
Attempts to comprehend Martian surface processes through interpretation of the oxygen isotopic compositions of carbonates in SNC meteorites p 3867 N93-31962

METEOROIDS
Meteor impacts, sporadic E layer formation and the incoherent scatter method
[IRF-SF-210] p 3852 N93-31624

METEOROLOGICAL INSTRUMENTS
Measurement uncertainties of the NCAR air motion systems
[PB93-184208] p 3764 N93-32068

METEOROLOGICAL PARAMETERS
Preliminary evaluation of aviation-impact variables derived from numerical models
[PB93-190197] p 3767 N93-31202
Investigation of atmospheric aerosols and gases at an east China station
[PB93-184539] p 3752 N93-31831
Tropical cyclone forecasters reference guide, No. 3: Tropical cyclone formation
[AD-A265216] p 3768 N93-32005
Thermodynamic structure of subsidence inversions in the Atlantic subtropical anticyclone regime
[AD-A265406] p 3768 N93-32043

METEOROLOGICAL RADAR
Airborne derivation of microburst alerts from ground-based Terminal Doppler Weather Radar information: A flight evaluation
[NASA-TM-108990] p 3680 N93-32223

METEOROLOGICAL SATELLITES
Navy tactical applications guide, part 2, volume 8: Arctic-East Siberian/Chukchi/Beaufort Seas. Weather analysis and forecast applications
[AD-A265585] p 3768 N93-31922

METEOROLOGY
The 3rd national heavy precipitation workshop
[PB93-186625] p 3767 N93-31329
GCM control run of UK Meteorological Office compared with the real climate in the NW European winter
[KNMI-WR-92-02] p 3767 N93-31601
Mean seasonal cycles and interannual variations at 0 deg, 165 deg E during 1986-1992
[PB93-186195] p 3768 N93-31874
The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop
[NASA-CP-3222] p 3758 N93-31878
Evolution of area-averaged vertical velocity in the convective region of a midlatitude squall line
[AD-A265333] p 3768 N93-32063

METHANE
Novel strategies for the synthesis of methane adsorbents with controlled porosity and high surface area
[PB93-189967] p 3702 N93-31209
New directions for the catalytic conversion of methane
[PB93-188795] p 3702 N93-31435

METHOD OF MOMENTS
A 17 keV neutrino and large magnetic moment solution of the solar neutrino puzzle
[DE93-608264] p 3819 N93-31662

METHYL ALCOHOL
Session of alcohol and biomass energy technology
[DE93-768440] p 3749 N93-32056
Feasibility study on introduction of petroleum substituting energy for transportation
[DE93-768472] p 3750 N93-32058

METRIC SPACE
On the scalar curvature of self-dual manifolds
[DE93-608194] p 3804 N93-31306

METRICATION
Metrication: An economic wake-up call for US industry
[PB93-188969] p 3714 N93-31109

METROLOGY
Measurement uncertainty considerations for coordinate measuring machines
[PB93-189819] p 3714 N93-31196
Surveillance schemes with applications to mass calibration
[PB93-181881] p 3810 N93-31430
Standard Reference Materials: Handbook for SRM users
[PB93-183796] p 3699 N93-31830

MICHELSON INTERFEROMETERS
The solar oscillations investigation: Michelson Doppler imager p 3867 N93-31345

MICROBALANCES
Micromachined chemical sensor with integrated microelectronics
[DE93-013761] p 3730 N93-32306

MICROBIOLOGY
Geochemical, genetic, and physiological control of pollutant biodegradation
[AD-A264106] p 3753 N93-32027
Microbiological test results of the environmental control and life support systems vapors compression distillation subsystem recycle tank components following various pretreatment protocols
[NASA-CR-192570] p 3772 N93-32354
Optimization of 15 parameters influencing the long-term survival of bacteria in aquatic systems
[NASA-CR-192571] p 3772 N93-32365

MICROBURSTS (METEOROLOGY)
Airborne derivation of microburst alerts from ground-based Terminal Doppler Weather Radar information: A flight evaluation
[NASA-TM-108990] p 3680 N93-32223

MICROCHANNEL PLATES
Development of high resolution imaging detectors for x ray astronomy
[NASA-CR-193653] p 3851 N93-32363

MICROCRACKS
Probabilistic fracture finite elements
p 3695 N93-31571

MICROCRYSTALS
Prometheus in space: Survey report of Research Committee on Functional New Material
p 3710 N93-31728

MICROELECTRONICS
An integrated eddy current detection and imaging system on a silicon chip p 3693 N93-31560
R and D status report: RF vacuum microelectronics
[AD-A264381] p 3721 N93-32033
Micromachined chemical sensor with integrated microelectronics
[DE93-013761] p 3730 N93-32306

MICROHARDNESS
Corrosion-erosion of alloys exposed in fluidised bed combustors
[NPL-DMM(A)-80] p 3705 N93-31602

MICROMECHANICS
Overall properties of composite materials: A general model based on periodic microstructure
p 3699 N93-31143

MICROORGANISMS
Geochemical, genetic, and physiological control of pollutant biodegradation
[AD-A264106] p 3753 N93-32027
Micro-organisms, cytotoxins and radioactive preparation: Risks at rescue operations in hospital environment
[FOA-A-40065-4.5] p 3772 N93-32423

MICROPROCESSORS
Petite amateur naval satellite spacecraft digital control system: A hardware design
[AD-A265234] p 3690 N93-32061
A PC-based simulation of the National Transonic Facility's safety microprocessor
[NASA-TM-109003] p 3796 N93-32224

MICROSCOPY
Investigation of carbon near the graphite-diamond-liquid triple point
[DE93-609052] p 3708 N93-31178

MICROSTRIP ANTENNAS
Efficient numerical techniques for the analysis of complex microstrip-antennas and microstrip-arrays
[ESA-TT-1259] p 3717 N93-31861

MICROSTRUCTURE
Computer simulation of 3D material microstructure and its application in the determination of mechanical behavior of polycrystalline materials and engineering structures
p 3708 N93-31134
Overall properties of composite materials: A general model based on periodic microstructure
p 3699 N93-31143
HREM study of crystallography of titanium and titanium hydride thin films
[DE93-609038] p 3828 N93-31176
Use of titanium castings without a casting factor
[AD-A264414] p 3705 N93-31192
Microstructural studies of ceramic thermal carrier coatings; how it influences coatings thermomechanical resistance
[ONERA-NT-1992-9] p 3709 N93-31597
An investigation of squeeze-cast alloy 718
[NASA-TM-108412] p 3706 N93-31646
Material characterization and fractographic examination of Ti-17 fatigue crack growth specimens for SMP SC33
p 3681 N93-31744
Study of improved critical currents and mechanical properties in YBaCuO superconductor with Ag or 211
[AD-A265749] p 3829 N93-31804
Damping mechanisms in chemically vapor deposited SiC fibers
[NASA-TM-109236] p 3701 N93-32219

MICROWAVE CIRCUITS
Synthesis and realization of a monolithic active bandpass filter for the Ku band
[LAAS-92365] p 3719 N93-31173
High temperature superconducting films and multilayers for electronics
[AD-A264410] p 3828 N93-31190

MICROWAVE IMAGERY
Determination of the robustness of passive microwave measurements and derivative parameters for use in precipitation discrimination over land
[AD-A265492] p 3768 N93-32008

MICROWAVE LANDING SYSTEMS
Evaluation of the flyability of MLS curved approaches for wide-body aircraft
[NLR-TP-91396-U] p 3680 N93-32416

MICROWAVE RADIOMETERS
The microwave radiometer as a remote sensing device: Design and application
[ISBN-9-09-005507-X] p 3746 N93-31537
ESTAR: The Electronically Scanned Thinned Array Radiometer for remote sensing measurement of soil moisture and ocean salinity
[NASA-TM-4523] p 3747 N93-32362

MICROWAVE SENSORS
Ground- and satellite-derived flight-path measurements as demonstrated in the AFES Avionics Flight Evaluation System (AFES) p 3677 N93-31281

MICROWAVE SOUNDING
Determination of the robustness of passive microwave measurements and derivative parameters for use in precipitation discrimination over land
[AD-A265492] p 3768 N93-32008

MICROWAVE SPECTRA
ESTAR: The Electronically Scanned Thinned Array Radiometer for remote sensing measurement of soil moisture and ocean salinity
[NASA-TM-4523] p 3747 N93-32362

MICROWAVE SPECTROMETERS
Isotopically selective detection of rubidium in krypton
[ETN-93-94051] p 3703 N93-31630

MICROWAVES
Carbon diffusion in uncoated and titanium nitride coated iron substrates during microwave plasma assisted chemical vapor deposition of diamond
[DE93-608934] p 3708 N93-31174
Mechanisms of microwave induced damage in biologic materials
[AD-A264415] p 3772 N93-32035
MIDAIR COLLISIONS
UK airmisses involving commercial air transport, September - December 1991
[ETN-93-93930] p 3674 N93-32409
MIDLATITUDE ATMOSPHERE
Evolution of area-averaged vertical velocity in the convective region of a midlatitude squall line
[AD-A265333] p 3768 N93-32063
MIE SCATTERING
An acoustic scattering code
[AD-A265863] p 3816 N93-32316
MILITARY AIR FACILITIES
Land subsidence and problems affecting land use at Edwards Air Force Base and vicinity, California, 1990
[PB93-182236] p 3765 N93-32191
MILITARY OPERATIONS
The Army and military in space
[AD-A264581] p 3812 N93-32013
Crisis action planning and replanning using SIPE-2
p 3835 N93-32131
C-141 aircrew sleep and fatigue during the Persian Gulf conflict p 3782 N93-32265
Digital flight data as a measure of pilot performance associated with fatigue from continuous operations during the Persian Gulf conflict p 3782 N93-32268
MILITARY SPACECRAFT
EHF military communication satellite alternatives study
[SS/L-TR00775] p 3716 N93-31311
MILITARY TECHNOLOGY
EHF military communication satellite alternatives study
[SS/L-TR00775] p 3716 N93-31311
The Army and military in space
[AD-A264581] p 3812 N93-32013
TeleOperator/telePresence System (TOPS) Concept Verification Model (CVM) development
p 3784 N93-32112
MILLIMETER WAVES
The 1st International Conference on Millimeter Wave and Far-Infrared Technology
[AD-A264268] p 3715 N93-31096
MIMD (COMPUTERS)
The performance of PAGOSA on several MIMD parallel computers
[DE93-003243] p 3786 N93-31183
Evaluating master-slave implementation of double-dot parsing for massive parallel MIMD systems
[REPT-92-78] p 3794 N93-31473
Feed-forward volume rendering algorithm for moderately parallel MIMD machines
[NASA-CR-191158] p 3792 N93-32322
MINERAL DEPOSITS
Availability of platinum and platinum-group metals
[PB93-189496] p 3743 N93-31115
Reconstruction of late Wisconsinan Ice Sheet and sea-level implications p 3758 N93-31879
Calculated mineral precipitation upon evaporation of a model Martian groundwater near 0 C
p 3862 N93-31940
MINERALOGY
The mineralogy and formation processes of Mars soil
p 3861 N93-31934
Martian weathering/alteration scenarios from spectral studies of ferric and ferrous minerals
p 3862 N93-31935
The fate of iron on Mars: Mechanism of oxidation of basaltic minerals to ferric-bearing assemblages
p 3862 N93-31938
Effect of DCB extraction on Mossbauer and spectral data for a Hawaiian palagonitic soil (PN-9): Iden tification of pigmentary phases p 3864 N93-31950
Composition of weakly altered Martian crust: Clues from imaging spectroscopy p 3865 N93-31952
Reflectance spectroscopy and GEX simulation of palagonite and iron-rich montmorillonite clay mixtures: Implications for the surface composition of Mars
p 3865 N93-31954
Infrared optical properties of Mars soil analog materials: Palagonites p 3866 N93-31957
MINERALS
MSATT Workshop on Chemical Weathering on Mars
[NASA-CR-193209] p 3861 N93-31933
The mineralogy and formation processes of Mars soil
p 3861 N93-31934
Martian weathering/alteration scenarios from spectral studies of ferric and ferrous minerals
p 3862 N93-31935
The fate of iron on Mars: Mechanism of oxidation of basaltic minerals to ferric-bearing assemblages
p 3862 N93-31938
Chemical modeling constraints on Martian surface mineralogies formed in an early, warm, wet climate, and speculations on the occurrence of phosphate minerals in the Martian regolith p 3865 N93-31956
MINING
Structure and properties of energetic materials
[AD-A265775] p 3713 N93-31800
MINKOWSKI SPACE
On the Dirac equation in three dimensions
[DE93-609915] p 3813 N93-31181
MIRRORS
An electrostatic mirror for neutral polar molecules
[DE93-609405] p 3818 N93-31228
A self-aligning interferometer suitable for white or monochromatic light consisting solely of a mirror and a reflection grating, part 2
[DE93-609517] p 3823 N93-31246
Mirror mode and other compressive ULF modes
p 3719 N93-31711
MISSILES
Towards a new approach to autonomous navigation for a vehicle: A link between probability data association filtering and the evidence theory
[ONERA-NT-1990-11] p 3798 N93-31427
MISSION PLANNING
Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition
[ESA-SP-348] p 3867 N93-31343
SOHO overview and preparation for operations
p 3867 N93-31344
Design for a complete SOHO mission under the ISTP
p 3880 N93-31424
Space Interferometry Science Working Group
p 3846 N93-31761
Protocols for distributive scheduling
p 3835 N93-32129
Scheduling with partial orders and a causal model
p 3835 N93-32130
Crisis action planning and replanning using SIPE-2
p 3835 N93-32131
Combining qualitative and quantitative spatial and temporal information in a hierarchical structure: Approximate reasoning for plan execution monitoring
p 3835 N93-32132
MIXERS
Commissioning and operating instructions of one pint (US) mixer
[MRL-TN-634] p 3713 N93-31639
MIXING LAYERS (FLUIDS)
Streamwise vorticity generation and mixing enhancement in free jets by delta-tabs
[NASA-TM-106235] p 3672 N93-31648
Turbulence measurement in a reacting and non-reacting shear layer at a high subsonic Mach number
[NASA-TM-106186] p 3673 N93-31839
Structure and stability of reacting compressible free shear layers
[AD-A265594] p 3727 N93-32095
Time accurate simulations of compressible shear flows
[NASA-CR-193410] p 3728 N93-32371
MOBILE COMMUNICATION SYSTEMS
Phased array for mobile satellite communications
[ESA-TT-1280] p 3716 N93-31342
MOBILITY
Planetary rover developments at JPL
p 3737 N93-32115
MODAL RESPONSE
Modal measurements and propeller field excitation on acoustic full scale mockup of SAAB 340 aircraft
[FFA-TN-1992-08] p 3815 N93-31051
MODE
Mirror mode and other compressive ULF modes
p 3719 N93-31711
MODEL REFERENCE ADAPTIVE CONTROL
Estimation and control in discrete-time nonlinear systems p 3797 N93-31071
MODELS
Current state of the mass storage system reference model p 3840 N93-31965
MODULATION
Auditory spectro-temporal pattern analysis
[AD-A264691] p 3773 N93-31981
Trellis coded modulation applied to orthogonal signals
[AD-A265232] p 3717 N93-32060
MODULATORS
Multi-quantum well lateral-field-effect electro-refraction modulator
[AD-A264411] p 3729 N93-31191
Efficient optical logic, interconnections and processing using quantum confined structures
[AD-A265734] p 3823 N93-31799
Quantum well optical waveguide modulators
[AD-A265421] p 3824 N93-32050
Development of a large field-of-view KD potassium di-deuterium phosphate modulator: Center Director's Discretionary Fund
[NASA-TM-108410] p 3824 N93-32378
MODULES
Development of jitter measurement procedures for digital fiber optic modules
[AD-A265550] p 3824 N93-31915
Advanced Transport Operating System (ATOPS) utility library software description
[NASA-CR-191469] p 3680 N93-32218
MODULUS OF ELASTICITY
Computer simulation of 3D material microstructure and its application in the determination of mechanical behavior of polycrystalline materials and engineering structures
p 3708 N93-31134
MOIRE EFFECTS
Measurement of the out-of-plane shear response of thick section composite materials using the v-notched beam specimen
[AD-A264898] p 3699 N93-31065
MOISTURE CONTENT
Aqueous geochemistry on Mars: Possible clues from salts and clays in SNC meteorites p 3863 N93-31944
MOLECULAR BEAM EPITAXY
Optoelectronic Materials Center: A collaborative program including University of New Mexico, Stanford University and California Institute of Technology
[AD-A265575] p 3732 N93-32052
MOLECULAR BEAMS
An electrostatic mirror for neutral polar molecules
[DE93-609405] p 3818 N93-31228
MOLECULAR CLOUDS
Submillimetre line observations of molecular clouds
p 3848 N93-31772
MOLECULAR EXCITATION
Exciton solitary waves in molecular crystals
[DE93-608693] p 3827 N93-31100
The three-body problem in the ground-state representation
[DE93-608164] p 3803 N93-31289
MOLECULAR GASES
Quantum spectra and dynamics p 3831 N93-31129
Development of practical MO techniques for prediction of the properties and behavior of materials
[AD-A265730] p 3820 N93-31798
MOLECULAR IONS
Infrared multiple photon dissociation spectra of gaseous ions
[AD-A264378] p 3821 N93-32032
MOLECULAR ORBITALS
Development of practical MO techniques for prediction of the properties and behavior of materials
[AD-A265730] p 3820 N93-31798
MOLECULAR SPECTRA
Quantum spectra and dynamics p 3831 N93-31129
Atomic and molecular line observations of galaxies
p 3847 N93-31771
An analysis of the composition of auroral emissions in the near infrared
[AD-A265493] p 3764 N93-32009
MOLECULAR STRUCTURE
Metastability in molecules
[AD-A264344] p 3817 N93-31063
Hierarchical textures in ferroelectric crystals
[DE93-608938] p 3827 N93-31175
Molecular dynamical and structural studies for the bakelite by neutron cross section measurements
[DE93-609444] p 3819 N93-31244
The effect of alkyl substituents on the macrocycle ring on enantiomeric recognition by chiral pyridino-18-crown-6 for 1-naphthylethylamine
[AD-A265513] p 3704 N93-31918
Cyclocarbon coalescence: Mechanisms for tailormade fullerene formation
[AD-A265489] p 3821 N93-31995
Structural characterization of nylon 7 by solid-state NMR, DSC, and ATR-FTIR
[AD-A265800] p 3822 N93-32312
MOLECULES
Metastability in molecules
[AD-A264344] p 3817 N93-31063
MOMENTUM TRANSFER
Momentum transport through the chromosphere
p 3852 N93-31677
Novel spin effects in quantum chromodynamics
[DE93-010955] p 3833 N93-32181
MONITORS
Daily exercise routines p 3689 N93-31455
Intelligent security assessment for a mobile robot
[AD-A265003] p 3799 N93-32078

MONOCHROMATORS
Adaptive optics for high power beam lines using diamond crystal monochromators
[DE93-009328] p 3824 N93-31987
MONOPOLES
Gravitation of global topological defects
p 3757 N93-31130
MONOPROPELLANTS
Metastability in molecules
[AD-A264344] p 3817 N93-31063
MONSOONS
Determination of the robustness of passive microwave measurements and derivative parameters for use in precipitation discrimination over land
[AD-A265492] p 3768 N93-32008
MONTE CARLO METHOD
Mathematical simulation of the induced gamma-radiation in structural materials of spaceships
[DE93-606751] p 3688 N93-31076
Monte-Carlo simulations of secondary electron emission from CsI, induced by 1-10 keV x rays and electrons
[DE93-604906] p 3818 N93-31239
Experiences with different parallel programming paradigms for Monte Carlo particle transport leads to a portable toolkit for parallel Monte Carlo
[DE93-009061] p 3796 N93-31986
Polametric passive remote sensing of ocean surface
[AD-A265874] p 3746 N93-32173
Experimental analysis of computer system dependability
[NASA-CR-193401] p 3785 N93-32233
MONTMORILLONITE
Systematic variations in the spectral properties of bright regions on Mars p 3864 N93-31951
Reflectance spectroscopy and GEX simulation of palagonite and iron-rich montmorillonite clay mixtures: Implications for the surface composition of Mars
p 3865 N93-31954
MOODS
Effects of caffeine on mental performance and mood: Implications for aircrew members p 3783 N93-32269
MORTALITY
Radiation exposure in aircraft p 3753 N93-31928
MOTION PERCEPTION
A design for a visual motion transducer
[OUEL-1960/92] p 3785 N93-31054
The cube rotation test: A computer generated process for acquisition of mental spatial manipulator capability
p 3776 N93-31237
MOTION SICKNESS
Torsional vestibulo-ocular reflex measurements for identifying otolith asymmetries possibly related to space motion sickness susceptibility
[NASA-CR-193304] p 3774 N93-32364
MOUNTAINS
Chemistry and acidity of cloud water at Mount Washington, NH
[PB93-190684] p 3767 N93-31206
MULTIENGINE VEHICLES
Mandatory multi-engined training syllabus
[CAP-601] p 3776 N93-31729
MULTIGRID METHODS
WBNFLOW: Multi-grid/multi-block potential solver for compressible flow. User's guide
[FFA-TN-1992-43] p 3723 N93-31146
Fast computation of magnetohydrostatic equilibria using Euler potentials and multigrid methods
p 3877 N93-31401
Benchmark solutions for the incompressible Navier-Stokes equations in general coordinates on staggered grids
[REPT-92-67] p 3724 N93-31496
Roe's scheme and the MUSCL technique for the Navier-Stokes equations
[MEMO-1090] p 3725 N93-31527
Numerical study of a multigrid method with four smoothing methods for the incompressible Navier-Stokes equations in general coordinates
[REPT-93-04] p 3725 N93-31547
An ILU smoother for the incompressible Navier-Stokes equations in general coordinates
[REPT-92-91] p 3725 N93-31634
Multigrid schemes for time-dependent incompressible Navier-Stokes equations
[REPT-92-102] p 3725 N93-31657
Galerkin coarse grid approximation in multigrid for the incompressible Navier-Stokes equations
[REPT-92-103] p 3726 N93-31658
On waveform multigrid method
[NASA-CR-191455] p 3808 N93-31843
Mapping robust parallel multigrid algorithms to scalable memory architectures
[NASA-CR-191470] p 3793 N93-32359
MULTIMEDIA
Newly available technologies present expanding opportunities for scientific and technical information exchange p 3837 N93-31217
End users: New products and services
p 3837 N93-31220
The computer integrated documentation project: A merge of hypermedia and AI techniques
p 3801 N93-32148
Automation and hypermedia technology applications
p 3843 N93-32155
MULTIPHOTON ABSORPTION
The Optical Stark effect of the exciton due to dynamical coupling between quantized states of the electron and hole in quantum wells
[DE93-608520] p 3819 N93-31665
MULTIPLE ACCESS
Blocking probabilities in a loss system with arrivals in geometrically distributed batches and heterogeneous service requirements
[MEMO-1074] p 3812 N93-32392
MULTIPROCESSING (COMPUTERS)
Symposium on Applied Mathematical Programming and Modeling (APMOD93): Volume of extended abstracts
[AD-A264091] p 3784 N93-31087
Periodic multiprocessor scheduling
[ETN-93-94043] p 3795 N93-31522
Formal specification and verification of concurrent programs
[AD-A265201] p 3790 N93-31793
Decay-usage scheduling in multiprocessor and distributed systems. 1: Theory
[REPT-92-105] p 3795 N93-31864
Performance analysis of a large-grain dataflow scheduling paradigm
[NASA-TP-3323] p 3796 N93-32213
High performance FORTRAN without templates: An alternative model for distribution and alignment
[NASA-CR-191451] p 3792 N93-32323
Global synchronization algorithms for the Intel iPSC/860
[NASA-CR-193618] p 3793 N93-32361
MULTIPROGRAMMING
Performance analysis of a large-grain dataflow scheduling paradigm
[NASA-TP-3323] p 3796 N93-32213
MULTISENSOR APPLICATIONS
Sensor fusion for assured vision in space applications
p 3824 N93-32105
MULTIVARIATE STATISTICAL ANALYSIS
Multivariate problems of statistics, combinatorics, reliability, and signal processing
[AD-A265213] p 3811 N93-32003
Experimental analysis of computer system dependability
[NASA-CR-193401] p 3785 N93-32233
MUSCULAR FUNCTION
Protein requirements in hypoxia or hypokinesia
p 3778 N93-32244

N

NAKHLITES
Geochemistry and setting of Martian weathering: The Lafayette meteorite p 3866 N93-31961
NAP-OF-THE-EARTH NAVIGATION
Flight evaluation of a computer aided low-altitude helicopter flight guidance system
[NASA-TM-103998] p 3678 N93-32225
NASA PROGRAMS
Newly available technologies present expanding opportunities for scientific and technical information exchange p 3837 N93-31217
NASA aerospace pyrotechnically actuated systems: Program plan
[NASA-TM-109226] p 3712 N93-31308
NASA Engineering and Technology Advancement Office: A proposal to the administrator
[NASA-TM-109229] p 3685 N93-31312
Science Information Systems Newsletter, issue 28
[NASA-TM-108266] p 3834 N93-31589
NASA patent abstracts bibliography: A continuing bibliography. Section 1: Abstracts (supplement 43)
[NASA-SP-7039(43)-SECT-1] p 3839 N93-31923
The applicability and availability of Former Soviet Union (FSU) space-related capabilities and facilities to energy-related space activities of Department of Energy, Department of Defense and National Aeronautics and Space Administration
[DE93-010286] p 3686 N93-32178
The 1992 Langley Aerospace Research Summer Scholars (LARSS) program
[NASA-CR-193371] p 3333 N93-32229
Propulsion technology challenges for turn-of-the-century commercial aircraft
[NASA-TM-106192] p 3682 N93-32351
NASA patent abstracts bibliography: A continuing bibliography. Section 2: Indexes (supplement 43)
[NASA-SP-7039(43)-SECT-2] p 3842 N93-32376
NATURAL GAS
Environment and safety research
[PB93-188860] p 3751 N93-31142
Novel strategies for the synthesis of methane adsorbents with controlled porosity and high surface area
[PB93-189967] p 3702 N93-31209
GRI proceedings on the Workshop on Plastic Pipe Research Results
[PB93-190460] p 3708 N93-31211
Long-term reliability of gas pipeline repairs by reinforced composites. Annual report, July 1991-June 1992
[PB93-188647] p 3700 N93-31334
Projects within the Center for Advanced Materials
[PB93-175222] p 3699 N93-31870
Feasibility study on introduction of petroleum substituting energy for transportation
[DE93-768472] p 3750 N93-32058
NATURAL GAS EXPLORATION
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 1: Executive summary
[PB93-186062] p 3770 N93-31873
Shaly sand formation evaluation in tight gas sands using electrochemical potential measurements
[PB93-163186] p 3764 N93-32087
NATURAL LANGUAGE (COMPUTERS)
Automating multilingual communication
p 3837 N93-31219
Neural nets and their relevance for information retrieval
[CL-91-02] p 3798 N93-31469
DIAC at TWI
[REPT-92-77] p 3787 N93-31472
Implementations of the double dot parsing algorithm
[REPT-92-73] p 3788 N93-31506
Kohonen feature maps in natural language processing
[CL-91-01] p 3788 N93-31517
VDM specification of the Secure Hash algorithm
[NPL-DITC-212/92] p 3790 N93-31735
Creating a structured knowledge base by parsing natural language text p 3839 N93-31854
Cooperative answers in database systems
p 3843 N93-32153
ARIES: Acquisition of Requirements and Incremental Evolution of Specifications p 3794 N93-32157
NAUTICAL CHARTS
An electronic sea map p 3745 N93-31262
NAVIER-STOKES EQUATION
Numerical simulations of three-dimensional laminar flow over a backward facing step; flow near side walls
[NASA-TM-106248] p 3723 N93-31147
The ViB-code to simulate 3-D stator/rotor flow in axial turbines
[DLR-FB-92-19] p 3681 N93-31170
Contribution to the experimental and theoretical study of vortex breakdown
[ONERA-NT-1990-12] p 3724 N93-31477
Termination criteria for GMRES-like methods to solve the discretized incompressible Navier-Stokes equations
[REPT-92-50] p 3724 N93-31484
Benchmark solutions for the incompressible Navier-Stokes equations in general coordinates on staggered grids
[REPT-92-67] p 3724 N93-31496
Roe's scheme and the MUSCL technique for the Navier-Stokes equations
[MEMO-1090] p 3725 N93-31527
Numerical study of a multigrid method with four smoothing methods for the incompressible Navier-Stokes equations in general coordinates
[REPT-93-04] p 3725 N93-31547
An ILU smoother for the incompressible Navier-Stokes equations in general coordinates
[REPT-92-91] p 3725 N93-31634
Multigrid schemes for time-dependent incompressible Navier-Stokes equations
[REPT-92-102] p 3725 N93-31657
Galerkin coarse grid approximation in multigrid for the incompressible Navier-Stokes equations
[REPT-92-103] p 3726 N93-31658
Radiation/convection coupling in rocket motor and plume analysis
[NASA-CR-193288] p 3698 N93-31845
Numerical simulation of the flow in a 1:57-scale axisymmetric model of a large blast simulator
[AD-A265551] p 3685 N93-31916
Navier-Stokes computations for kinetic energy projectiles in steady coning motion: A predictive capability for pitch damping
[AD-A264111] p 3726 N93-32028

An incompressible axisymmetric through-flow calculation procedure for design and off-design analysis of turbomachinery
[AD-A264933] p 3726 N93-32071

NAVIGATION
A preliminary empirical evaluation of virtual reality as an instructional medium for visual-spatial tasks
p 3784 N93-32151

NAVIGATION AIDS
Reports on Cartography and Topography, series 1, report no. 103
[ETN-90-97325] p 3744 N93-31256
Aerial cartography using SICAD NAV-AIR
p 3744 N93-31258
An electronic sea map p 3745 N93-31262
A searching method in a declarative city map
p 3746 N93-31270

NAVIGATION INSTRUMENTS
Aerial cartography using SICAD NAV-AIR
p 3744 N93-31258
Pallet for helicopter test instrumentation
p 3676 N93-31279

NAVY
Navy tactical applications guide, part 2, volume 8: Arctic-East Siberian/Chukchi/Beaufort Seas. Weather analysis and forecast applications
[AD-A265585] p 3768 N93-31922

NEAR FIELDS
Effect of sound on boundary layer stability
[NASA-CR-193367] p 3816 N93-32238

NEAR INFRARED RADIATION
SISTERS: A space interferometer for the search for terrestrial exo-planets by rotation shearing
p 3846 N93-31764
Summary of the splinter session on optical and UV science p 3848 N93-31773
An analysis of the composition of auroral emissions in the near infrared
[AD-A265493] p 3764 N93-32009

NEODYMIUM LASERS
Cerenkov type phase-matched second harmonic generation in polymeric channel waveguides
[AD-A265787] p 3710 N93-31801
Cutting parameters with Lasag lasers
[DE93-010403] p 3732 N93-32288

NEPTUNE (PLANET)
Analysis of Uranian radio emissions, Uranus Data Analysis Program (UDAP)
[NASA-CR-193524] p 3882 N93-32222
User friendly database for Neptune planetary radio astronomy observations
[NASA-CR-193261] p 3851 N93-32324

NETHERLANDS
Review of aerodynamic design in the Netherlands
[NLR-TP-91260-U] p 3679 N93-31840
Remote sensing: A powerful aid for the analysis of problems in the north Holland Vechtstreek
[ETN-93-93468] p 3747 N93-32344

NETWORK ANALYSIS
Transient analysis for ground fault distance estimation in electrical distribution networks
[VTT-PUBS-115] p 3720 N93-31536
Data communication network at the ASRM facility
[NASA-CR-193625] p 3686 N93-32236
Implementation of interconnect simulation tools in spice
[NASA-CR-193619] p 3792 N93-32239

NETWORK CONTROL
Neural nets for aligning optical components in harsh environments: Beam smoothing spatial filter as an example p 3693 N93-31557

NEURAL NETS
A method to predict the orbital lifetimes of free tethers and tether-trailing satellites using artificial neural networks p 3687 N93-31069
Optimization of adaptive resonance theory network with boltzmann machine
[PB93-188134] p 3797 N93-31332
NASA/ARC proposed training in intelligent control
p 3688 N93-31444
Introduction to Fuzzy Set Theory
p 3689 N93-31446
Neural nets and their relevance for information retrieval
[CL-91-02] p 3798 N93-31469
Neural nets for aligning optical components in harsh environments: Beam smoothing spatial filter as an example p 3693 N93-31557
Neural attentional sensory processing
[AD-A265163] p 3799 N93-31992
The effect of sensory input on trajectories generated by recurrent neural networks
[AD-A264501] p 3799 N93-32036
A soft-competitive splitting rule for adaptive tree-structured neural networks
[AD-A264936] p 3799 N93-32073
Piecewise linear neural networks
[AD-A265031] p 3799 N93-32082
Man-machine cooperation in advanced teleoperation
p 3784 N93-32106
A neural network approach to seismic phase identification
[DE93-013601] p 3800 N93-32305
Neural network identification of keystream generators
[AD-A265778] p 3800 N93-32334
High level cognitive information processing in neural networks
[NASA-CR-193296] p 3800 N93-32341
Introduction to natural algorithms
[REPT-92-058] p 3793 N93-32391

NEUROLOGY
Computing with neural maps: Application to perceptual and cognitive function
[AD-A264092] p 3743 N93-31060

NEURONS
Organization of the human circadian system
[AD-A264675] p 3774 N93-32015

NEUROPHYSIOLOGY
Computing with neural maps: Application to perceptual and cognitive function
[AD-A264092] p 3743 N93-31060
Organization of the human circadian system
[AD-A264675] p 3774 N93-32015
Neurophysiological analysis of circadian rhythm entrainment
[AD-A264681] p 3774 N93-32018

NEUTRAL BUOYANCY SIMULATION
Potential roles for EVA and telerobotics in a unified worksite p 3690 N93-32118

NEUTRINOS
Three-neutrino oscillations in matter and topological phases
[DE93-608386] p 3813 N93-31290
Massive neutrinos
[DE93-609989] p 3821 N93-32026
Sterile neutrinos as dark matter
[DE93-012533] p 3822 N93-32294

NEUTRON CROSS SECTIONS
ENDF/B-6 neutron cross section measurement standards
[PB93-189868] p 3818 N93-31201
Molecular dynamical and structural studies for the bakelite by neutron cross section measurements
[DE93-609444] p 3819 N93-31244

NEUTRON DIFFRACTION
Fundamental studies of new high-energy permanent magnet materials
[DE93-014707] p 3815 N93-32291

NEUTRON FLUX DENSITY
A plotting system for three-dimensional oblique coordinates (triangular mesh) of CITATION
[DE92-526848] p 3792 N93-32185

NEUTRON IRRADIATION
Detection of radiation-induced changes in electrochemical properties of austenitic stainless steels using miniaturized specimens and the single-loop electrochemical potentiokinetic reactivation method
[DE93-012865] p 3707 N93-32302

NEUTRON SCATTERING
Molecular dynamical and structural studies for the bakelite by neutron cross section measurements
[DE93-609444] p 3819 N93-31244

NEUTRON SPECTRA
ENDF/B-6 neutron cross section measurement standards
[PB93-189868] p 3818 N93-31201

NEUTRON STARS
Periodic x ray flares of NGC 6814: Gravitational lensing of an accreting neutron star?
[DE92-642586] p 3851 N93-31073

NEW MEXICO
Air quality studies in Albuquerque, New Mexico
[PB93-190817] p 3751 N93-31212

NEWTON METHODS
On the real symmetric inverse eigenvalue problem
[DE93-619667] p 3809 N93-32284

NICKEL ALLOYS
Cumulative fatigue damage behavior of MAR M-247
p 3696 N93-31575
The effect of porosity and gamma-gamma' eutectic content on the low cycle fatigue behavior of hydrogen-charged PWA-1480 p 3696 N93-31576
Secondary orientation effects in a single crystal superalloy under mechanical and thermal loads
p 3696 N93-31578
An investigation of squeeze-cast alloy 718
[NASA-TM-108412] p 3706 N93-31646
Fatigue in single crystal nickel superalloys
[AD-A265451] p 3706 N93-31795

NIGHTGLOW
The effects of magnetic storm phases on F-layer irregularities from auroral to equatorial latitudes
[AD-A264908] p 3764 N93-32094

NITRATES
Total CO2 and nitrate measurements in the southwest pacific during austral autumn, 1990
[PB93-188415] p 3769 N93-31333
Mars brine formation experiment
p 3864 N93-31949

NITRIDING
Improved gallium nitride and aluminum nitride electronic materials
[AD-A264570] p 3710 N93-32010

NITROGEN OXIDES
Global changes and the air-sea exchange of chemicals
[DE93-605636] p 3750 N93-31092
Climatic effects of turbofan emissions in the stratosphere and the higher troposphere p 3753 N93-31927
Effects of commercial flight pollution on human health
p 3753 N93-31931
Regional modeling analysis of the dependencies of atmospheric oxidants to perturbations in NOx and hydrocarbon emissions
[PB93-180925] p 3754 N93-32070
Relationships between ozone precursor levels and response to emissions reductions: Analysis of regional oxidant model results for the northeastern United States
[PB93-186294] p 3756 N93-32189

NOBLE METALS
Characterization of small noble metal electrodes by voltammetry and energy dispersive x ray analysis
[AD-A265208] p 3721 N93-32001

NOISE INTENSITY
Noise from high speed maglev systems: Noise sources, noise criteria, preliminary design guidelines for noise control, and recommendations for acoustical test facility for maglev research
[PB93-154896] p 3736 N93-32193

NOISE POLLUTION
Effects on health of noise disturbances due to air traffic p 3753 N93-31929
Reaction to aircraft noise near general aviation airfields
[DORA-8203] p 3817 N93-32377

NOISE PREDICTION
The prediction of noise from co-axial jets
[ISVR-TR-215] p 3817 N93-32339

NOISE PROPAGATION
Near bottom data collection and data analysis
[AD-A265872] p 3771 N93-32172

NOISE REDUCTION
Noise attenuating circuit for mechanical relay including optical isolation
[AD-D015700] p 3720 N93-31842
Noise from high speed maglev systems: Noise sources, noise criteria, preliminary design guidelines for noise control, and recommendations for acoustical test facility for maglev research
[PB93-154896] p 3736 N93-32193
Control of jet noise
[NASA-CR-193552] p 3816 N93-32221

NONADIABATIC CONDITIONS
Intuitive approach to modified gyrokinetic equation and numerical confirmation
[DE93-604671] p 3812 N93-31083

NONDESTRUCTIVE TESTS
Use of titanium castings without a casting factor
[AD-A264414] p 3705 N93-31192
Pulse holographic measurement techniques
[DE93-607634] p 3729 N93-31835
Internal structural characterization
[AD-A264762] p 3738 N93-31982

NONEQUILIBRIUM PLASMAS
Investigation of PACVD protective coating processes using advanced diagnostics techniques
[DE93-013978] p 3711 N93-32307

NONLINEAR EQUATIONS
Resonance and near-resonance for a nonlinear wave equation
[REPT-92-92] p 3814 N93-31633
A mechanics model for the compressive response of fiber reinforced composites
[AD-A265556] p 3701 N93-32067

NONLINEAR EVOLUTION EQUATIONS
Model of a rotating magnetic cloud
p 3857 N93-31707

NONLINEAR OPTICS
Nonlinear response function for two-phonon polaritons
[DE93-608692] p 3817 N93-31099
Multi-quantum well lateral-field-effect electro-refraction modulator
[AD-A264411] p 3729 N93-31191

Cerenkov type phase-matched second harmonic generation in polymeric channel waveguides
[AD-A265787] p 3710 N93-31801
Functionalized polymeric materials for electronics and optics
[AD-A265788] p 3710 N93-31802
Research studies in electromagnetically induced transparency
[AD-A264303] p 3732 N93-31866
Photoconductivity and photovoltage generation in novel photocrosslinkable nonlinear optical polymers
[AD-A265780] p 3750 N93-32417

NONLINEAR PROGRAMMING
Real-time trajectory optimization on parallel processors
[NASA-CR-193303] p 3795 N93-31640

NONLINEAR SYSTEMS
Estimation and control in discrete-time nonlinear systems p 3797 N93-31071
Global stability of systems of two differential equations with unstationary nonlinearities, 2
[DE92-642558] p 3802 N93-31072
Dissipation and convergence in the systems of differential equations with unstationary nonlinearities
[DE92-642559] p 3802 N93-31079
Eddy vortices produced by nonlinear reflection of a gravity wave at a critical level p 3757 N93-31155
An operator method to study some resonance boundary value problems in elasticity theory
[REPT-92-84] p 3740 N93-31490
Chaotic dynamics of high density photon and exciton system
[DE93-608522] p 3819 N93-31666
Desktop chaotic systems: Intuition and visualization
[NASA-TM-106258] p 3808 N93-31847
An analysis of the composition of auroral emissions in the near infrared
[AD-A265493] p 3764 N93-32009
The effect of sensory input on trajectories generated by recurrent neural networks
[AD-A264501] p 3799 N93-32036
Finite-dimensional approximation for operator equations of Hammerstein type
[DE93-619669] p 3809 N93-32286
Convergence rates and finite-dimensional approximations for nonlinear ill-posed problems involving monotone operators in Banach spaces
[DE93-619670] p 3809 N93-32287
Nonlinear disturbance decoupling and linearization: A partial interpretation of integral feedback
[MEMO-1093] p 3801 N93-32400

NONLINEARITY
Measurement of the out-of-plane shear response of thick section composite materials using the v-notched beam specimen
[AD-A264898] p 3699 N93-31065
Nonlinear response function for two-phonon polaritons
[DE93-608692] p 3817 N93-31099
Exciton solitary waves in molecular crystals
[DE93-608693] p 3827 N93-31100
An operator method to study some resonance boundary value problems in elasticity theory
[REPT-92-84] p 3740 N93-31490
Nonlinear interaction of Alfven waves in solar atmosphere p 3860 N93-31724
A continuation method for computing non-linear 3-D free surface flows
[DE93-008704] p 3727 N93-32175
Investigation of transitions from order to chaos in dynamical systems
[DE93-014437] p 3833 N93-32290

NORTH AMERICA
Recent changes of weather patterns in North America
[DE93-013982] p 3769 N93-32289

NORTH SEA
An electronic sea map p 3745 N93-31262

NOSES (FOREBODIES)
Development of nose structure of a reconnaissance container for a supersonic jet aircraft
[MBB-LME-242-S-PUB-0451] p 3679 N93-31046

NOTCH SENSITIVITY
Measurement of the out-of-plane shear response of thick section composite materials using the v-notched beam specimen
[AD-A264898] p 3699 N93-31065

NOTCH TESTS
Evaluation of the chevron notch fracture toughness test for brittle materials
[NPL-DMM(A)-72] p 3742 N93-32384

NOZZLE FLOW
An experimental study of under-expanded jets
[OUEL-1959/92] p 3722 N93-31124
Penn State axial flow turbine facility: Performance and nozzle flow field p 3698 N93-31588

NOZZLE GEOMETRY
Enhanced mixing of a rectangular supersonic jet by natural and induced screech
[NASA-TM-106245] p 3672 N93-31672

NOZZLE INSERTS
Streamwise vorticity generation and mixing enhancement in free jets by delta-tabs
[NASA-TM-106235] p 3672 N93-31648

NUCLEAR BINDING ENERGY
KDP 903
[DE93-715539] p 3818 N93-31167

NUCLEAR ELECTRIC PROPULSION
NASA's progress in nuclear electric propulsion technology
[NASA-TM-106272] p 3698 N93-31858

NUCLEAR ENGINE FOR ROCKET VEHICLES
F2D: A two-dimensional compressible gas flow code
[DE93-003239] p 3723 N93-31169

NUCLEAR EXPLOSIONS
The performance of PAGOSA on several MIMD parallel computers
[DE93-003243] p 3786 N93-31183

NUCLEAR FUEL REPROCESSING
Applications of optical fiber to remote laser fluorescence analysis
[DE93-607553] p 3732 N93-31826

NUCLEAR FUSION
Tokamak plasma shape identification based on the boundary integral equations
[DE93-715383] p 3825 N93-31097
Fusion energy for space: Feasibility demonstration. A proposal to NASA
[NASA-TM-109227] p 3825 N93-31309

NUCLEAR MAGNETIC RESONANCE
NMR studies of organic thin films
[AD-A264903] p 3707 N93-31066
Computerized tomography and its applications: A guided tour
[CS-9206] p 3789 N93-31629
Structural characterization of nylon 7 by solid-state NMR, DSC, and ATR-FTIR
[AD-A265800] p 3822 N93-32312
Synthesis and characterization of copolymers of nylon 11 and nylon 12
[AD-A265841] p 3711 N93-32314

NUCLEAR MEDICINE
Annual report of the National Institute of Radiological Sciences
[DE93-704237] p 3820 N93-31810

NUCLEAR PHYSICS
Proceedings of the Workshop on Spin-Charge Transfer Reaction in Atomic Collision Process for planning of next period of cascade project
[DE93-704290] p 3821 N93-31834

NUCLEAR PROPULSION
Fusion energy for space: Feasibility demonstration. A proposal to NASA
[NASA-TM-109227] p 3825 N93-31309
Study of wall heat transfer from a high temperature dissociated hydrogen impinging jet
[DE92-017845] p 3698 N93-32184

NUCLEAR REACTIONS
Supercritical pomeron and spin effects in meson-nucleon scattering at high energy
[DE93-608327] p 3818 N93-31242

NUCLEAR RESEARCH AND TEST REACTORS
Unclassified satellite remote sensing as a component of integrated treaty verification
[DE93-005736] p 3744 N93-31187

NUCLEAR ROCKET ENGINES
The Thermionic Fuel Element Verification Program: Technical progress and future plans
[DE93-003797] p 3691 N93-31185
Study of wall heat transfer from a high temperature dissociated hydrogen impinging jet
[DE92-017845] p 3698 N93-32184

NUCLEAR STRUCTURE
Novel spin effects in quantum chromodynamics
[DE93-010955] p 3833 N93-32181
Nuclear structure effects in elastic and inelastic scattering of light ions
[DE93-616909] p 3822 N93-32407

NUCLEON-NUCLEON INTERACTIONS
Relativistic transport theory
[KVI-952] p 3830 N93-31121
Nuclear structure effects in elastic and inelastic scattering of light ions
[DE93-616909] p 3822 N93-32407

NUCLEON-NUCLEON SCATTERING
Covariant description of the delta in nuclear matter
[KVI-951] p 3817 N93-31149
Complex Kohn variational principle for the solution of Lippmann-Schwinger equations
[DE93-609885] p 3814 N93-31910

NUCLEOPHILES
Phenylethynyl endcapping reagents and reactive diluents
[NASA-CASE-LAR-14796-1] p 3702 N93-31459

NUMERICAL ANALYSIS
Case studies in the numerical solution of oscillatory integrals
[DE92-642554] p 3801 N93-31067
Biharmonic pattern selection
[DE93-608186] p 3803 N93-31303
Numerical analysis of the spectral domain of transmission lines in dielectric layers
[REPT-92-068] p 3716 N93-31608
Numerical methods for inverse problems in three-dimensional geophysical modeling, phase 2
[PB93-181584] p 3758 N93-31872
Statistical and numerical methods in control and identification
[AD-A264676] p 3811 N93-32016
Conference: Three Decades of Numerical Linear Algebra at Berkeley
[AD-A264964] p 3809 N93-32076
Numerical studies of low temperature gallium arsenide buffer layers and their influence on device operation
[AD-A264296] p 3829 N93-32083
Transmission of sound through a rotor
[NLR-TP-92014-U] p 3683 N93-32386

NUMERICAL DIFFERENTIATION
Development of practical MO techniques for prediction of the properties and behavior of materials
[AD-A265730] p 3820 N93-31798
Determination of the robustness of passive microwave measurements and derivative parameters for use in precipitation discrimination over land
[AD-A265492] p 3768 N93-32008

NUMERICAL INTEGRATION
Sobolev-type orthogonal polynomials with a small number of real zeros
[REPT-92-64] p 3806 N93-31549

NUMERICAL STABILITY
Stable numerical integration of dynamical systems subject to equality state-space constraints
[NLR-TP-91363-U] p 3802 N93-31128
Least squares orthogonal polynomial approximation in several independent variables
[DE93-609832] p 3802 N93-31180

NUMERICAL WEATHER FORECASTING
Preliminary evaluation of aviation-impact variables derived from numerical models
[PB93-190197] p 3767 N93-31202

NUSSELT NUMBER
Terminal project heat convection in thin cylinders
[DE93-609489] p 3723 N93-31245

NUTRITION
Nutrition, Metabolic Disorders and Lifestyle of Aircrew
[AGARD-CP-533] p 3777 N93-32240
An automated processing system for food frequency and nutrition knowledge questionnaire p 3778 N93-32241
Nutritional assessment of United States tactical air command pilots p 3778 N93-32242
Nutrition for a typical MAC crew during Desert Storm p 3778 N93-32245
Nutritional and lifestyle status of 50 pilots of the Portugese Air Force p 3780 N93-32255
The influence of dietary counseling and cardiac catheterization on lipid profiles in American military aviators p 3781 N93-32259
Biological parameters and cardiovascular risk factors with the flying personnel of the Belgian Armed Forces p 3781 N93-32260

NUTRITIONAL REQUIREMENTS
Nutrition for a typical MAC crew during Desert Storm p 3778 N93-32245
Changes in food and energy intake in military aircrew p 3778 N93-32246
Trial of emergency ration of the Spanish Air Force p 3778 N93-32247
Nutritional and lifestyle status of 50 pilots of the Portugese Air Force p 3780 N93-32255

NYLON (TRADEMARK)
Structural characterization of nylon 7 by solid-state NMR, DSC, and ATR-FTIR
[AD-A265800] p 3822 N93-32312
Synthesis and characterization of copolymers of nylon 11 and nylon 12
[AD-A265841] p 3711 N93-32314

O

OBJECT-ORIENTED PROGRAMMING
Assuring type safety of object-oriented languages
[REPT-92-061] p 3787 N93-31252
Object oriented application flow graphs and their semantics
[CT-92-01] p 3788 N93-31528

A new definition of the subtype relation
[AD-A265548] p 3791 N93-32066
Knowledge-based simulation using object-oriented programming p 3794 N93-32127
Agent oriented programming: An overview of the framework and summary of recent research p 3794 N93-32136

OBLATE SPHEROIDS
Satellite motion around an oblate planet: A perturbation solution for all orbital parameters
[AD-A265779] p 3690 N93-32335

OBLIQUE COORDINATES
A plotting system for three-dimensional oblique coordinates (triangular mesh) of CITATION
[DE92-526848] p 3792 N93-32185

OBLIQUE SHOCK WAVES
Analytical and experimental investigations of the oblique detonation wave engine concept
[NASA-TM-102839] p 3683 N93-32374

OBSERVATION
Static and dynamic loop models and their observational signatures p 3873 N93-31377
The prominence-corona interface: Models and observations p 3873 N93-31378
GCM control run of UK Meteorological Office compared with the real climate in the NW European winter
[KNMI-WR-92-02] p 3767 N93-31601

OCCUPATION
Selection of personnel for stressful occupations: The potential utility of psychophysiological measures as selection tools
[AD-A264571] p 3776 N93-32011

OCEAN BOTTOM
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 1: Executive summary
[PB93-186062] p 3770 N93-31873
Lithology and chronology of ice-sheet fluctuations (magnetic susceptibility of cores from the western Ross Sea) p 3759 N93-31880
The diatom record from beneath the West Antarctic Ice Sheet and the global proxy perspective p 3759 N93-31882
Benthic study of the continental slope off Cape Hatteras, North Carolina, volume 2
[PB93-186070] p 3771 N93-32190
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 3: Appendices
[PB93-186088] p 3771 N93-32308

OCEAN COLOR SCANNER
SeaWiFS Technical Report Series. Volume 4: An analysis of GAC sampling algorithms: A case study
[NASA-TM-104566-VOL-4] p 3771 N93-32360

OCEAN CURRENTS
Global changes and the air-sea exchange of chemicals
[DE93-605636] p 3750 N93-31092
The parameterization of vertical turbulent mixing processes in a general circulation model of the tropical Pacific
[KNMI-WR-92-03] p 3758 N93-31594
Hydrographic observations in the western tropical and subtropical North Atlantic Ocean: Atlantic Climate Change Program (ACCP) and Western Tropical Atlantic Experiment (WESTRAX) during 1991
[PB93-184778] p 3770 N93-31832
A numerical study of seasonal wind forcing effects on the California current system
[AD-A264951] p 3770 N93-32075

OCEAN DYNAMICS
The parameterization of vertical turbulent mixing processes in a general circulation model of the tropical Pacific
[KNMI-WR-92-03] p 3758 N93-31594

OCEAN MODELS
Modeling studies of ice-ocean dynamics and thermodynamics
[AD-A264084] p 3769 N93-31082
The parameterization of vertical turbulent mixing processes in a general circulation model of the tropical Pacific
[KNMI-WR-92-03] p 3758 N93-31594
GCM control run of UK Meteorological Office compared with the real climate in the NW European winter
[KNMI-WR-92-02] p 3767 N93-31601
Modeling and inference for transient tracers on oceanic flow
[AD-A265428] p 3770 N93-32037
A numerical study of seasonal wind forcing effects on the California current system
[AD-A264951] p 3770 N93-32075
Coupled ocean-atmosphere GCM simulation of Southern Oscillation phenomena
[DE93-012583] p 3766 N93-32297

OCEAN SURFACE
Tides of Massachusetts and Cape Cod Bays
[AD-A264790] p 3770 N93-31983
Polametric passive remote sensing of ocean surface
[AD-A265874] p 3746 N93-32173

OCEAN THERMAL ENERGY CONVERSION
Japan's Sunshine Project
[DE93-768309] p 3748 N93-31811

OCEANOGRAPHIC PARAMETERS
Hydrographic observations in the western tropical and subtropical North Atlantic Ocean: Atlantic Climate Change Program (ACCP) and Western Tropical Atlantic Experiment (WESTRAX) during 1991
[PB93-184778] p 3770 N93-31832
Navy tactical applications guide, part 2, volume 8: Arctic-East Siberian/Chukchi/Beaufort Seas. Weather analysis and forecast applications
[AD-A265585] p 3768 N93-31922
A new view of the sea
[ETN-93-93469] p 3747 N93-32345

OCEANOGRAPHY
The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop
[NASA-CP-3222] p 3758 N93-31878
Research platforms FLIP and ORB support
[AD-A265910] p 3771 N93-32320
A new view of the sea
[ETN-93-93469] p 3747 N93-32345

OCEANS
The Martian ocean: First acid, then alkaline p 3866 N93-31958

OFFSHORE ENERGY SOURCES
Benthic study of the continental slope off Cape Hatteras, North Carolina, volume 2
[PB93-186070] p 3771 N93-32190
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 3: Appendices
[PB93-186088] p 3771 N93-32308

OFFSHORE PLATFORMS
Research platforms FLIP and ORB support
[AD-A265910] p 3771 N93-32320

OIL POLLUTION
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 1: Executive summary
[PB93-186062] p 3770 N93-31873

OILS
Statistical and numerical methods in control and identification
[AD-A264676] p 3811 N93-32016

OLIGOMERS
Phenylethynyl endcapping reagents and reactive diluents
[NASA-CASE-LAR-14796-1] p 3702 N93-31459

ON-LINE SYSTEMS
End users: New products and services p 3837 N93-31220
Software to model AXAF image quality
[NASA-CR-192574] p 3789 N93-31637
Real-time trajectory optimization on parallel processors
[NASA-CR-193303] p 3795 N93-31640
Online guided tour of the Cleanup Information Bulletin Board System. (CLU-IN: Cleanup Information Bulletin Board)
[PB93-193704] p 3752 N93-31818
Applications of optical fiber to remote laser fluorescence analysis
[DE93-607553] p 3732 N93-31826
Graphics simulation and training aids for advanced teleoperation p 3793 N93-32119
An on-line expert system for diagnosing environmentally induced spacecraft anomalies using CLIPS p 3794 N93-32142
The computer integrated documentation project: A merge of hypermedia and AI techniques p 3801 N93-32148

ONBOARD DATA PROCESSING
On board image processing for telescience support
[NLR-TP-91213-U] p 3823 N93-31056
The Large Angle Spectroscopic Coronagraph (LASCO): Visible light coronal imaging and spectroscopy p 3868 N93-31350

ONBOARD EQUIPMENT
On-board derived flight-path measurement as demonstrated by an ILS measurement system p 3677 N93-31282

OPERATING COSTS
Maglev program test plan
[PB93-154904] p 3736 N93-32194
Enhanced methods for determining operational capabilities and support costs of proposed space systems
[NASA-CR-193265] p 3812 N93-32350

OPERATING SYSTEMS (COMPUTERS)
Formal specification and verification of concurrent programs
[AD-A265201] p 3790 N93-31793

OPERATING TEMPERATURE
Lubrication of an 85-mm ball bearing with RP-1
[NASA-TM-106254] p 3686 N93-31670

OPERATIONS RESEARCH
Job shop scheduling by local search
[MEMO-COSOR-92-29] p 3834 N93-31510

OPERATORS (MATHEMATICS)
Existence of viable solutions for nonconvex-valued differential inclusions in Banach spaces
[DE92-644669] p 3803 N93-31285
The nth roots with Hilbert-Schmidt defect operator of normal contractions
[DE93-608163] p 3803 N93-31288
A note on the Dirac canonical quantization of massive Yang-Mills theory
[DE93-608199] p 3813 N93-31460
An operator method to study some resonance boundary value problems in elasticity theory
[REPT-92-84] p 3740 N93-31490
A single recursion operator is sufficient
[REPT-92-59] p 3805 N93-31500
The shot continuation operator
[REPT-92-065] p 3758 N93-31606

OPERATORS (PERSONNEL)
Selection by simulation: A work sample approach to the selection of process algebras
[ISBN-9-09-005483-9] p 3811 N93-31618

OPTICAL BISTABILITY
Excitonic bistabilities, instabilities and chaos in laser-pumped semiconductor
[DE93-608677] p 3731 N93-31669

OPTICAL COMMUNICATION
Combinatorial pulse position modulation for power-efficient free-space laser communications
[NASA-TM-106241] p 3717 N93-31856
Space qualification for an intersatellite laser communications system
[AD-A265145] p 3717 N93-31989

OPTICAL DATA PROCESSING
Design of coupled mace filters for optical pattern recognition using practical spatial light modulators
[NASA-CR-193192] p 3823 N93-31841
Surface-emitting laser-based optical switching: An update
[DE93-010689] p 3732 N93-32180

OPTICAL DATA STORAGE MATERIALS
Goddard Conference on Mass Storage Systems and Technologies, volume 2
[NASA-CP-3198-VOL-2] p 3839 N93-31964
Kodak phase-change media for optical tape applications p 3730 N93-31974

OPTICAL DISKS
Kodak phase-change media for optical tape applications p 3730 N93-31974

OPTICAL EQUIPMENT
OPAD 1991 p 3693 N93-31559
Software to model AXAF image quality
[NASA-CR-192574] p 3789 N93-31637
Modeling of optical waveguide biosensor structures
[VTT-PUBS-112] p 3824 N93-32421

OPTICAL FILTERS
AOTF enhancements for a space-based spectropolarimeter
[NASA-CR-193290] p 3691 N93-31040
Neural nets for aligning optical components in harsh environments: Beam smoothing spatial filter as an example p 3693 N93-31557
Design of coupled mace filters for optical pattern recognition using practical spatial light modulators
[NASA-CR-193192] p 3823 N93-31841

OPTICAL FLOW (IMAGE ANALYSIS)
Expansion-based passive ranging
[NASA-TM-104025] p 3678 N93-32348

OPTICAL HETERODYNING
An investigation of the channel crosstalk in optical heterodyne controlled phased array radars
[AD-A265412] p 3717 N93-32046

OPTICAL MATERIALS
Optoelectronic Materials Center: A collaborative program including University of New Mexico, Stanford University and California Institute of Technology
[AD-A265575] p 3732 N93-32052
Photoconductivity and photovoltage generation in novel photocrosslinkable nonlinear optical polymers
[AD-A265780] p 3750 N93-32417

OPTICAL MEASUREMENT
Mathematical inversion of multiple-scattering of laser light
[DE93-609128] p 3803 N93-31224
Neural nets for aligning optical components in harsh environments: Beam smoothing spatial filter as an example p 3693 N93-31557
Progress in speckle-shift strain measurement p 3693 N93-31558
OPAD 1991 p 3693 N93-31559

Space-based astrometric optical interferometry with POINTS p 3845 N93-31758
Investigation of diamond homoepitaxy by in situ Fizeau interferometry: The role of oxygen
[AD-A265544] p 3829 N93-31921
Surface roughness measuring systems
[VTT-TIED-1392] p 3748 N93-32420

OPTICAL MEASURING INSTRUMENTS
On board image processing for telescience support
[NLR-TP-91213-U] p 3823 N93-31056
Telescience pilot experiment results using telePODI
[NLR-TP-90326-U] p 3823 N93-31118
OPAD 1991 p 3693 N93-31559
Optically powered photomultiplier tube
[AD-D015735] p 3722 N93-32207

OPTICAL MEMORY (DATA STORAGE)
Electron trapping optical data storage system and applications p 3730 N93-31975

OPTICAL PROPERTIES
Light-induced band-structure modifications in modulation-doped 3-5 semiconductor heterostructures
[ETN-93-94053] p 3828 N93-31619
Functionalized polymeric materials for electronics and optics
[AD-A265788] p 3710 N93-31802
Aerosol optical properties of the free troposphere
[AD-A265795] p 3758 N93-31803
Infrared optical properties of Mars soil analog materials: Palagonites p 3866 N93-31957
Precipitation hardening of infrared transmitting ZnS ceramics
[AD-A265184] p 3710 N93-31993
Optoelectronic Materials Center: A collaborative program including University of New Mexico, Stanford University and California Institute of Technology
[AD-A265575] p 3732 N93-32052
An acoustic scattering code
[AD-A265863] p 3816 N93-32316

OPTICAL PUMPING
Excitation rate and background measurements during LIF studies on krypton
[DE93-013500] p 3732 N93-32304
Photoconductivity and photovoltage generation in novel photocrosslinkable nonlinear optical polymers
[AD-A265780] p 3750 N93-32417

OPTICAL RADAR
Unclassified satellite remote sensing as a component of integrated treaty verification
[DE93-005736] p 3744 N93-31187
Mathematical inversion of multiple-scattering of laser light
[DE93-609128] p 3803 N93-31224

OPTICAL SWITCHING
Surface-emitting laser-based optical switching: An update
[DE93-010689] p 3732 N93-32180

OPTICAL WAVEGUIDES
Cerenkov type phase-matched second harmonic generation in polymeric channel waveguides
[AD-A265787] p 3710 N93-31801
Quantum well optical waveguide modulators
[AD-A265421] p 3824 N93-32050
Modeling of optical waveguide biosensor structures
[VTT-PUBS-112] p 3824 N93-32421

OPTIMAL CONTROL
Integrated structural design, vibration control, and aeroelastic tailoring by multiobjective optimization p 3739 N93-31137
Tethered systems control p 3689 N93-31453
Necessary and sufficient conditions for J-spectral factorizations with a J-lossless property for infinite-dimensional systems in continuous and discrete time
[W-9217] p 3798 N93-31512
Analytic system problems and J-lossless factorization for infinite-dimensional linear systems
[W-9218] p 3798 N93-31513
Sampled-data and discrete-time H2 optimal control
[W-9222] p 3798 N93-31525
H infinity-control with measurement-feedback for Pritchard-Salamon system
[W-9211] p 3799 N93-31628
The optimal projection equations for digital control of infinite-dimensional systems
[REPT-93-01] p 3799 N93-31851
Optimal control problems for parabolic boundary control systems p 3800 N93-32216
A parametric analysis of endoatmospheric Low-Earth-Orbit maintenance
[AD-A265868] p 3685 N93-32319
Optimization of 15 parameters influencing the long-term survival of bacteria in aquatic systems
[NASA-CR-192571] p 3772 N93-32365
Variational Trajectory Optimization Tool Set: Technical description and user's manual
[NASA-TM-4442] p 3690 N93-32381

OPTIMIZATION
Optimal design and imperfection sensitivity of nonlinear shell structures
[FFA-TN-1992-30] p 3739 N93-31123
Integrated structural design, vibration control, and aeroelastic tailoring by multiobjective optimization p 3739 N93-31137
Reduction method with system analysis for multiobjective optimization-based design
[NASA-CR-191456] p 3803 N93-31194
ALGODESK: An experimental comparison of eight evolutionary heuristics applied to the QAP problem
[REPT-92-052] p 3786 N93-31250
Optimization of adaptive resonance theory network with boltzmann machine
[PB93-188134] p 3797 N93-31332
Optimal solutions to a two-block H infinity problem
[MEMO-1080] p 3798 N93-31468
Duality and sensitivity in quadratic optimization over a sphere
[REPT-92-65] p 3804 N93-31470
On a class of geometric vector optimization problems
[REPT-92-51] p 3804 N93-31485
Job shop scheduling by local search
[MEMO-COSOR-92-29] p 3834 N93-31510
Periodic multiprocessor scheduling
[ETN-93-94043] p 3795 N93-31522
Sampled-data and discrete-time H2 optimal control
[W-9222] p 3798 N93-31525
The crease structure of the Karush-Kuhn-Tucker set in parametric optimization
[REPT-92-62] p 3806 N93-31551
Review of aerodynamic design in the Netherlands
[NLR-TP-91260-U] p 3679 N93-31840
The optimal projection equations for digital control of infinite-dimensional systems
[REPT-93-01] p 3799 N93-31851
Parametric and combinatorial problems in constrained optimization
[AD-A265595] p 3792 N93-32096
Ant system for job-shop scheduling
[REPT-92-066] p 3792 N93-32346

OPTOELECTRONIC DEVICES
Optoelectronic Materials Center: A collaborative program including University of New Mexico, Stanford University and California Institute of Technology
[AD-A265575] p 3732 N93-32052

ORBIT CALCULATION
Orbit Analysis Tools Software user's manual, version 1
[AD-A265012] p 3686 N93-32081
Satellite motion around an oblate planet: A perturbation solution for all orbital parameters
[AD-A265779] p 3690 N93-32335

ORBITAL ASSEMBLY
Performance analysis of a robotic system for space-based assembly p 3801 N93-32101
Automated assembly of large space structures using an expert system executive p 3690 N93-32102
JSC flight experiment recommendation in support of Space Station robotic operations p 3691 N93-32121

ORBITAL ELEMENTS
A method to predict the orbital lifetimes of free tethers and tether-trailing satellites using artificial neural networks p 3687 N93-31069

ORBITAL SERVICING
A vision system planner for increasing the autonomy of the Extravehicular Activity Helper/Retriever
[NASA-CR-193301] p 3777 N93-31844
Graphics simulation and training aids for advanced teleoperation p 3793 N93-32119
A parametric analysis of endoatmospheric Low-Earth-Orbit maintenance
[AD-A265868] p 3685 N93-32319

ORDER-DISORDER TRANSFORMATIONS
Local order and concentration fluctuations in K-Pb and Rb-Pb alloys
[DE93-606725] p 3704 N93-31093
Numerical evidence for two types of localized states in a two-dimensional disordered lattice
[DE92-642677] p 3827 N93-31159
Investigation of carbon near the graphite-diamond-liquid triple point
[DE93-609052] p 3708 N93-31178
Relaxational dynamics and precursor domains in the non-linear shell model
[DE92-642676] p 3820 N93-31805
Nonclassical disordered phase in the strong quantum limit of frustrated antiferromagnets
[DE92-645691] p 3815 N93-31806
Relativistic band gaps in one-dimensional disordered systems
[DE93-609841] p 3829 N93-31814
Investigation of transitions from order to chaos in dynamical systems
[DE93-014437] p 3833 N93-32290

ORDNANCE
Commissioning and operating instructions of one pint (US) mixer
[MRL-TN-634] p 3713 N93-31639

ORGANIC COMPOUNDS
Kinetics of mediated electron transfer between viologen groups in a self-assembled monolayer and metal complexes in solution
[AD-A265729] p 3820 N93-31797

ORGANIC MATERIALS
Geochemical, genetic, and physiological control of pollutant biodegradation
[AD-A264106] p 3753 N93-32027

ORGANIZATIONS
The management of change: Implications for the information professional p 3838 N93-31222
Forecasting and planning for changing patterns of Scientific and Technical Communication (STC) p 3838 N93-31223
The standards process: X3 information processing systems p 3840 N93-31966

ORGANOMETALLIC COMPOUNDS
Improved gallium nitride and aluminum nitride electronic materials
[AD-A264570] p 3710 N93-32010

ORTHOGONAL FUNCTIONS
Sobolev-type orthogonal polynomials with a small number of real zeros
[REPT-92-64] p 3806 N93-31549

ORTHOGONALITY
Least squares orthogonal polynomial approximation in several independent variables
[DE93-609832] p 3802 N93-31180
Some new results for chain-sequence polynomials
[MEMO-1081] p 3806 N93-31515

OSCILLATIONS
Determination of design and operation parameters for upper atmospheric research instrumentation to yield optimum resolution with deconvolution. Appendix 7 --- Transform Domain Skiprope Observer for tethered satellites
[NASA-CR-192836] p 3756 N93-31041
Three-neutrino oscillations in matter and topological phases
[DE93-608386] p 3813 N93-31290
Coulomb-blockade oscillations in quantum dots and wires
[ETN-93-94055] p 3831 N93-31621
Irregular oscillations of the West Antarctic Ice Sheet p 3759 N93-31884
Massive neutrinos
[DE93-609989] p 3821 N93-32026
Diagnostics of magnetic substorms using satellite observations of magnetic pulsations
[AD-A264300] p 3764 N93-32084

OSCILLATORS
On the feasibility of a transient dynamic design analysis
[AD-A264882] p 3733 N93-31101
On the dynamics of aeroelastic oscillators with one degree of freedom
[REPT-92-96] p 3815 N93-31653
Steady states in the twin-well potential oscillator: Computer simulations and approximate analytical studies
[REPT-40/1992] p 3722 N93-32214

OTOLITH ORGANS
Torsional vestibulo-ocular reflex measurements for identifying otolith asymmetries possibly related to space motion sickness susceptibility
[NASA-CR-193304] p 3774 N93-32364

OXIDATION
New directions for the catalytic conversion of methane
[PB93-188795] p 3702 N93-31435
The fate of iron on Mars: Mechanism of oxidation of basaltic minerals to ferric-bearing assemblages p 3862 N93-31938
Chemical reactivity of the Martian soil p 3867 N93-31963
Si/SiO2 interface studies by immersion ellipsometry
[AD-A265151] p 3710 N93-31991
An electron cyclotron resonance plasma process for InP passivation
[AD-A265036] p 3826 N93-31996
Determination of the oxidative stability of perfluoropolyalkyl ethers and correlation with chemical structure
[NASA-TM-106223] p 3712 N93-32367

OXIDATION RESISTANCE
High temperature, oxidation resistant noble metal-Al alloy thermocouple
[NASA-CASE-LEW-15515-1] p 3729 N93-31298
Oxidation resistant overlay coatings for low expansion substrates
[NASA-CASE-LEW-15154-2] p 3708 N93-31300

OXIDATION-REDUCTION REACTIONS
Investigation of laser-induced retinal damage
[AD-A264096] p 3772 N93-31094
Kinetics of mediated electron transfer between viologen groups in a self-assembled monolayer and metal complexes in solution
[AD-A265729] p 3820 N93-31797
OXIDE FILMS
The determination of the thickness of the film materials by the PIXE method
[DE93-607555] p 3823 N93-31090
Corrosion-erosion of alloys exposed in fluidised bed combustors
[NPL-DMM(A)-80] p 3705 N93-31602
An electron cyclotron resonance plasma process for InP passivation
[AD-A265036] p 3826 N93-31998
Affecting factors to the electrical properties of RuO2 thick-film resistors
[DE93-768332] p 3721 N93-32055
OXIDIZERS
Relationships between ozone precursor levels and response to emissions reductions: Analysis of regional oxidant model results for the northeastern United States
[PB93-186294] p 3756 N93-32189
OXYGEN
Investigation of diamond homoepitaxy by in situ Fizeau interferometry: The role of oxygen
[AD-A265544] p 3829 N93-31921
In-situ bioventing: Two US EPA and Air Force sponsored field studies
[PB93-194231] p 3754 N93-32089
OXYGEN ISOTOPES
The diatom record from beneath the West Antarctic Ice Sheet and the global proxy perspective
p 3759 N93-31882
Attempts to comprehend Martian surface processes through interpretation of the oxygen isotopic compositions of carbonates in SNC meteorites p 3867 N93-31962
OZONE
Making clean gasoline: The effect on jet fuels
[AD-A264302] p 3713 N93-32085
Relationships between ozone precursor levels and response to emissions reductions: Analysis of regional oxidant model results for the northeastern United States
[PB93-186294] p 3756 N93-32189
OZONE DEPLETION
Engine technology challenges for a 21st Century High-Speed Civil Transport
[NASA-TM-106216] p 3681 N93-31671

P

PACIFIC OCEAN
Total CO2 and nitrate measurements in the southwest pacific during austral autumn, 1990
[PB93-188415] p 3769 N93-31333
PALEOCLIMATOLOGY
The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop
[NASA-CP-3222] p 3758 N93-31878
Lithology and chronology of ice-sheet fluctuations (magnetic susceptibility of cores from the western Ross Sea) p 3759 N93-31880
Macrofossil records of West Antarctic Ice Sheet retreat during the Holocene p 3759 N93-31881
Reconnaissance and deep-drill site selection on Taylor Dome, Antarctica p 3759 N93-31883
PALLADIUM
Availability of platinum and platinum-group metals
[PB93-189496] p 3743 N93-31115
PANEL METHOD (FLUID DYNAMICS)
TDLM: A Transonic Doublet Lattice Method for 3D potential unsteady transonic flow calculation
[DLR-FB-92-25] p 3671 N93-31171
Panel methods for aerodynamic analysis and design
[NLR-TP-91404-U] p 3674 N93-32357
PARALLEL FLOW
SPOT satellite mapping of Ice Stream B
p 3760 N93-31887
PARALLEL PROCESSING (COMPUTERS)
Scheduling data transfers in parallel computers and communications systems p 3836 N93-31132
The performance of PAGOSA on several MIMD parallel computers
[DE93-003243] p 3786 N93-31183
Generalized steady-state, applied to 2-D, 3-D massively parallel computing
[REPT-92-71] p 3795 N93-31504
A blueprint for a parallel parser generator
[MEMO-INF-92-65] p 3795 N93-31616
Real-time trajectory optimization on parallel processors
[NASA-CR-193303] p 3795 N93-31640
Experiences with different parallel programming paradigms for Monte Carlo particle transport leads to a portable toolkit for parallel Monte Carlo
[DE93-009061] p 3796 N93-31986
Statistical and numerical methods in control and identification
[AD-A264676] p 3811 N93-32016
Beyond data parallelism: The advantages of multiple parallelizations in combinatorial search
[AD-A265008] p 3796 N93-32080
Parametric and combinatorial problems in constrained optimization
[AD-A265595] p 3792 N93-32096
Massively parallel support for a case-based planning system p 3797 N93-32135
Surface-emitting laser-based optical switching: An update
[DE93-010689] p 3732 N93-32180
Performance measures of parallel digital signal processor systems
[AD-A265804] p 3718 N93-32313
Feed-forward volume rendering algorithm for moderately parallel MIMD machines
[NASA-CR-191158] p 3792 N93-32322
Application of compiler-assisted multiple instruction rollback recovery to speculative execution
[NASA-CR-193360] p 3796 N93-32355
Mapping robust parallel multigrid algorithms to scalable memory architectures
[NASA-CR-191470] p 3793 N93-32359
Parallel Jacobi iteration in implicit step-by-step methods
[CWI-NM-R9218] p 3810 N93-32394
Explicit, high-order Runge-Kutta-Nystroem methods for parallel computers
[CWI-NM-R9219] p 3796 N93-32395
Parallel block predictor-corrector methods of Runge-Kutta type
[CWI-NM-R9220] p 3797 N93-32396
PARALLEL PROGRAMMING
Evaluating master-slave implementation of double-dot parsing for massive parallel MIMD systems
[REPT-92-78] p 3794 N93-31473
Practical results on parallel parsing
[REPT-92-79] p 3794 N93-31493
Generalized steady-state, applied to 2-D, 3-D massively parallel computing
[REPT-92-71] p 3795 N93-31504
Implementations of the double dot parsing algorithm
[REPT-92-73] p 3788 N93-31506
Experiences with different parallel programming paradigms for Monte Carlo particle transport leads to a portable toolkit for parallel Monte Carlo
[DE93-009061] p 3796 N93-31986
Beyond data parallelism: The advantages of multiple parallelizations in combinatorial search
[AD-A265008] p 3796 N93-32080
PARAMETER IDENTIFICATION
The basic measurement equipment of the DLR test aircraft p 3675 N93-31273
The parameterization of vertical turbulent mixing processes in a general circulation model of the tropical Pacific
[KNMI-WR-92-03] p 3758 N93-31594
PARAMETERIZATION
The crease structure of the Karush-Kuhn-Tucker set in parametric optimization
[REPT-92-62] p 3806 N93-31551
PARSING ALGORITHMS
Evaluating master-slave implementation of double-dot parsing for massive parallel MIMD systems
[REPT-92-78] p 3794 N93-31473
Practical results on parallel parsing
[REPT-92-79] p 3794 N93-31493
Implementations of the double dot parsing algorithm
[REPT-92-73] p 3788 N93-31506
A blueprint for a parallel parser generator
[MEMO-INF-92-65] p 3795 N93-31616
Creating a structured knowledge base by parsing natural language text p 3839 N93-31854
PARTIAL DIFFERENTIAL EQUATIONS
Existence and uniqueness of limit cycles for a special system of differential equations on the plane
[REPT-92-63] p 3806 N93-31550
On waveform multigrid method
[NASA-CR-191455] p 3808 N93-31843
A remark about the mean curvature
[DE93-619668] p 3809 N93-32285
PARTICLE ACCELERATION
A double-peaked solar flare: Conclusions on particle transport p 3879 N93-31415
Ion acceleration at parallel shocks: Self-consistent plasma simulations p 3826 N93-31683
Influence of interplanetary shocks on approximately 10 MeV protons: A phenomenological classification
p 3854 N93-31686
Massive neutrinos
[DE93-609989] p 3821 N93-32026
PARTICLE ACCELERATOR TARGETS
Ceramics models in the MESA codes
[DE93-000683] p 3711 N93-32186
PARTICLE ACCELERATORS
The ZEUS uranium calorimeter: Main characteristics and first operating experience
[NIKHEF-H/92-15] p 3728 N93-31117
Optically guided laser wakefield acceleration
[AD-A265441] p 3732 N93-32019
PARTICLE COLLISIONS
Two jet production in hadron collisions at order alpha(sub s)(sup 3) in QCD
[DE93-010563] p 3822 N93-32159
PARTICLE EMISSION
The determination of the thickness of the film materials by the PIXE method
[DE93-607555] p 3823 N93-31090
PARTICLE INTERACTIONS
Odderon dominance in dipole model of hadron elastic scattering
[DE93-608329] p 3819 N93-31243
SQUIDs in thermal detectors of weakly interacting particles
[DE93-609531] p 3729 N93-31247
Interactions between tetraalkylammonium ions and silicates
[ETN-93-94057] p 3703 N93-31622
The structure of the dayside boundary layer between the Venus ionosphere and the shocked solar wind
p 3853 N93-31678
A unified approach to classical and quantum physics
[DE93-609843] p 3833 N93-32411
PARTICLE MASS
Massive neutrinos
[DE93-609989] p 3821 N93-32026
Proposal for an absolute, atomic definition of mass
[DE93-609842] p 3815 N93-32410
PARTICLE PRODUCTION
Pion multiplicity as a probe of the deconfinement transition in heavy-ion collisions
[DE93-608484] p 3817 N93-31059
Covariant description of the delta in nuclear matter
[KVI-951] p 3817 N93-31149
PARTICLE SIZE DISTRIBUTION
Integration of measurements with atmospheric dispersion models: Source term estimation for dispersal of (239)Pu due to non-nuclear detonation of high explosive
[DE93-012550] p 3766 N93-32295
PARTICLE SPIN
Radiation reaction for the classical relativistic spinning particle in scalar, tensor and linearized gravitational fields
[DE93-608191] p 3757 N93-31304
A generalization of Dirac non-linear electrodynamics, and spinning charged particles
[DE93-609847] p 3821 N93-31907
Helicity amplitudes for matter-coupled gravity
[DE93-609932] p 3832 N93-32025
PARTICLE TELESCOPES
Calibration of a detector system for solar energetic particles analysis p 3860 N93-31721
PARTICLE THEORY
Theory of deep-inelastic scattering reactions and x-rescaling model
[DE93-604519] p 3820 N93-31821
PARTICLES
Scattering by irregular particles in anomalous diffraction and discrete dipole approximations
p 3817 N93-31154
PARTITIONS (MATHEMATICS)
The crease structure of the Karush-Kuhn-Tucker set in parametric optimization
[REPT-92-62] p 3806 N93-31551
PASSENGER AIRCRAFT
Longitudinal acceleration test of overhead luggage bins in a transport airframe section
[DOT/FAA/CT-92/9] p 3674 N93-31652
Civil tiltrotor transport point design: Model 940A
[NASA-CR-191446] p 3701 N93-32234
PATENT POLICY
NASA patent abstracts bibliography: A continuing bibliography. Section 1: Abstracts (supplement 43)
[NASA-SP-7039(43)-SECT-1] p 3839 N93-31923
NASA patent abstracts bibliography: A continuing bibliography. Section 2: Indexes (supplement 43)
[NASA-SP-7039(43)-SECT-2] p 3842 N93-32376
PATHOLOGICAL EFFECTS
Effects of commercial flight pollution on human health
p 3753 N93-31931
PATTERN RECOGNITION
Computing with neural maps: Application to perceptual and cognitive function
[AD-A264092] p 3743 N93-31060

Extracting projective information from single views of 3D point sets
[OUEL-1927/92] p 3785 N93-31151
Automatic acquisition of elevation points in map-making using the TUEK 200 p 3745 N93-31263
Automatic recognition of solar features p 3880 N93-31421
A segmental hidden Markov model for speech pattern processing
[RSRE-MEMO-4599] p 3716 N93-31610
Design of coupled mace filters for optical pattern recognition using practical spatial light modulators
[NASA-CR-193192] p 3823 N93-31841
A vision system planner for increasing the autonomy of the Extravehicular Activity Helper/Retriever
[NASA-CR-193301] p 3777 N93-31844
Efficient fault diagnosis of helicopter gearboxes
[NASA-TM-106253] p 3735 N93-31846
Piecewise linear neural networks
[AD-A265031] p 3799 N93-32082

PAYLOAD INTEGRATION
Hitchhiker: Customer Accommodations and Requirements Specifications (CARS)
[NASA-TM-109225] p 3834 N93-31644

PAYLOADS
Auroral Cluster: Science objectives and measurement strategies p 3858 N93-31710
Ground Robotic Hand Applications for the Space Program study (GRASP)
[NASA-CR-193571] p 3737 N93-32235

PENDULUMS
Desktop chaotic systems: Intuition and visualization
[NASA-TM-106258] p 3808 N93-31847

PENETRATION
The development of a tungsten heavy alloy that fails by an adiabatic shear mechanism, phase 1
[AD-A265867] p 3707 N93-32318

PEPTIDES
Organization of the human circadian system
[AD-A264675] p 3774 N93-32015

PERFLUORO COMPOUNDS
Tribological characteristics of perfluoropolyether liquid lubricants under sliding conditions in high vacuum
[NASA-TM-106257] p 3711 N93-32352

PERFORMANCE PREDICTION
Automated failure mode effects and criticality analyses for reliability prediction of multibody mechanical systems p 3738 N93-31107
Enhanced methods for determining operational capabilities and support costs of proposed space systems
[NASA-CR-193265] p 3812 N93-32350

PERFORMANCE TESTS
Testability of artificial neural networks: A behavioral approach
[REPT-92-047] p 3797 N93-31254
Testing of an experimental FMS p 3676 N93-31277
An extended algorithm for performance evaluation of timed event graphs
[REPT-92-75] p 3787 N93-31474
National Media Laboratory: Media testing results p 3840 N93-31972
Performance of a distributed superscalar storage server p 3841 N93-31978
Architectural assessment of mass storage systems at GSFC p 3841 N93-31980
Near bottom data collection and data analysis
[AD-A265872] p 3771 N93-32172
Performance measures of parallel digital signal processor systems
[AD-A265804] p 3718 N93-32313

PERIODIC VARIATIONS
Periodic x ray flares of NGC 6814: Gravitational lensing of an accreting neutron star?
[DE92-642586] p 3851 N93-31073
A generalized asymptoticity problem in max algebra, the general case
[REPT-92-76] p 3804 N93-31471
The effect of sensory input on trajectories generated by recurrent neural networks
[AD-A264501] p 3799 N93-32036

PERIODICALS
The management of change: Implications for the information professional p 3838 N93-31222

PERMANENT MAGNETS
Fundamental studies of new high-energy permanent magnet materials
[DE93-014707] p 3815 N93-32291

PERSONAL COMPUTERS
A PC-based simulation of the National Transonic Facility's safety microprocessor
[NASA-TM-109003] p 3796 N93-32224

PERSONALITY
Selection of personnel for stressful occupations: The potential utility of psychophysiological measures as selection tools
[AD-A264571] p 3776 N93-32011

PERSONNEL
Selection of personnel for stressful occupations: The potential utility of psychophysiological measures as selection tools
[AD-A264571] p 3776 N93-32011
Cardiovascular risk factors in an Italian Air Force population: Preliminary report p 3775 N93-32252

PERSONNEL SELECTION
Selection by simulation: A work sample approach to the selection of process algebras
[ISBN-9-09-005483-9] p 3811 N93-31618
Abridged procedural guide to aircrew anthropometric accommodation assessment
[AD-A265220] p 3777 N93-32006
Selection of personnel for stressful occupations: The potential utility of psychophysiological measures as selection tools
[AD-A264571] p 3776 N93-32011

PERTURBATION
Differential inclusions governed by convex and nonconvex perturbation of a sweeping process
[DE92-644668] p 3802 N93-31160
Satellite motion around an oblate planet: A perturbation solution for all orbital parameters
[AD-A265779] p 3690 N93-32335

PERTURBATION THEORY
Perturbation technique for identification of the lowest modes of rotors with fluid interaction p 3738 N93-32277

PETRI NETS
Timing analysis of real-time systems
[REPT-92-060] p 3803 N93-31251
Modeling industrial distributed control systems with Petri nets
[REPT-92-079] p 3714 N93-31465
An extended algorithm for performance evaluation of timed event graphs
[REPT-92-75] p 3787 N93-31474
Performance analysis of a robotic system for space-based assembly p 3801 N93-32101

PETROGRAPHY
Reconstruction of late Wisconsinan Ice Sheet and sea-level implications p 3758 N93-31879
Lithology and chronology of ice-sheet fluctuations (magnetic susceptibility of cores from the western Ross Sea) p 3759 N93-31880
The fate of iron on Mars: Mechanism of oxidation of basaltic minerals to ferric-bearing assemblages p 3862 N93-31938

PETROLEUM PRODUCTS
Cost-effectiveness analysis of txDOT LPG fleet conversion, volume 1
[PB93-186492] p 3712 N93-31326
Cost-effectiveness analysis of txDOT LPG fleet conversion, volume 2
[PB93-186500] p 3713 N93-31327

PETROLOGY
Systematic variations in the spectral properties of bright regions on Mars p 3864 N93-31951
Reflectance spectroscopy and GEX simulation of palagonite and iron-rich montmorillonite clay mixtures: Implications for the surface composition of Mars p 3865 N93-31954

PH
Chemistry and acidity of cloud water at Mount Washington, NH
[PB93-190684] p 3767 N93-31206
The Martian ocean: First acid, then alkaline p 3866 N93-31958

PHASE CHANGE MATERIALS
Kodak phase-change media for optical tape applications p 3730 N93-31974

PHASE CONJUGATION
The application of synthetic-beacon technology to astronomy
[AD-A265146] p 3850 N93-31990

PHASE TRANSFORMATIONS
Investigation of carbon near the graphite-diamond-liquid triple point
[DE93-609052] p 3708 N93-31178
The Lipkin model second order phase transition in the deformed su(2) algebra description
[DE93-608201] p 3807 N93-31661
Relaxational dynamics and precursor domains in the non-linear shell model
[DE92-642676] p 3820 N93-31805
Pressure induced topological phase transitions in membranes
[AD-A265212] p 3829 N93-32002

PHASED ARRAYS
Phased array for mobile satellite communications
[ESA-TT-1280] p 3716 N93-31342
An investigation of the channel crosstalk in optical heterodyne controlled phased array radars
[AD-A265412] p 3717 N93-32046
Fix-tracking system
[AD-D015738] p 3718 N93-32210

PHONONS
Nonlinear response function for two-phonon polaritons
[DE93-608692] p 3817 N93-31099

PHOSPHATES
Chemical modeling constraints on Martian surface mineralogies formed in an early, warm, wet climate, and speculations on the occurrence of phosphate minerals in the Martian regolith p 3865 N93-31956

PHOSPHORIC ACID FUEL CELLS
Eleventh Annual Conference on Energy Conservation and Storage Technologies
[DE93-768429] p 3748 N93-32038

PHOTICS
Neurophysiological analysis of circadian rhythm entrainment
[AD-A264681] p 3774 N93-32018

PHOTOABSORPTION
Quantum spectra and dynamics p 3831 N93-31129
Efficient optical logic, interconnections and processing using quantum confined structures
[AD-A265734] p 3823 N93-31799
Infinite volume extrapolations of finite cluster calculations. How correct are these?
[AD-A265648] p 3809 N93-32170

PHOTOACOUSTIC SPECTROSCOPY
Vibrational overtone spectroscopy of cyclic amines: Pyridine and related compounds
[AD-A265524] p 3704 N93-31919

PHOTOCATHODES
Development of high resolution imaging detectors for x ray astronomy
[NASA-CR-193653] p 3851 N93-32363

PHOTOCHEMICAL OXIDANTS
Regional modeling analysis of the dependencies of atmospheric oxidants to perturbations in NOx and hydrocarbon emissions
[PB93-180925] p 3754 N93-32070

PHOTOCHEMICAL REACTIONS
Global changes and the air-sea exchange of chemicals
[DE93-605636] p 3750 N93-31092
Investigation of laser-induced retinal damage
[AD-A264096] p 3772 N93-31094
Regional modeling analysis of the dependencies of atmospheric oxidants to perturbations in NOx and hydrocarbon emissions
[PB93-180925] p 3754 N93-32070
Relationships between ozone precursor levels and response to emissions reductions: Analysis of regional oxidant model results for the northeastern United States
[PB93-186294] p 3756 N93-32189
Refine research plan for use of Atlas data
[NASA-CR-192611] p 3766 N93-32349

PHOTOCONDUCTIVITY
Photoconductivity and photovoltage generation in novel photocrosslinkable nonlinear optical polymers
[AD-A265780] p 3750 N93-32417

PHOTODIODES
CELIAS: Charge, Element and Isotope Analysis System for the SOHO mission p 3860 N93-31725
Surface roughness measuring systems
[VTT-TIED-1392] p 3748 N93-32420

PHOTODISSOCIATION
Quantum spectra and dynamics p 3831 N93-31129

PHOTOELECTRONS
Laser-assisted chemical vapor deposition of InN on Si(100)
[AD-A264266] p 3731 N93-31095

PHOTOLUMINESCENCE
Light-induced band-structure modifications in modulation-doped 3-5 semiconductor heterostructures
[ETN-93-94053] p 3828 N93-31619

PHOTOMAPPING
Monitoring vegetation greenness with satellite data
[PB93-190882] p 3744 N93-31213
Digital reading of road network data in developing a cartographic information system p 3744 N93-31259
Vegetation mapping for environment management and monitoring
[ETN-93-93466] p 3747 N93-32342

PHOTOMETERS
The NPL reference hazemeter
[NPL-QU-94] p 3729 N93-31325

PHOTOMULTIPLIER TUBES
Optically powered photomultiplier tube
[AD-D015735] p 3722 N93-32207

PHOTON BEAMS
Laser-assisted chemical vapor deposition of InN on Si(100)
[AD-A264266] p 3731 N93-31095
PHOTONS
Investigation of laser-induced retinal damage
[AD-A264096] p 3772 N93-31094
Laser-assisted chemical vapor deposition of InN on Si(100)
[AD-A264266] p 3731 N93-31095
Nonlinear response function for two-phonon polaritons
[DE93-608692] p 3817 N93-31099
Proceedings of the Workshop on Application of Circularly Polarized X Rays in the Region of 1 to 8 keV
[DE93-704276] p 3823 N93-31165
Chaotic dynamics of high density photon and exciton system
[DE93-608522] p 3819 N93-31666
Infrared multiple photon dissociation spectra of gaseous ions
[AD-A264378] p 3821 N93-32032
Infinite volume extrapolations of finite cluster calculations. How correct are these?
[AD-A265648] p 3809 N93-32170
PHOTOOXIDATION
Investigation of laser-induced retinal damage
[AD-A264096] p 3772 N93-31094
PHOTORECEPTORS
Melatonin, the pineal gland, and circadian rhythms
[AD-A264099] p 3772 N93-31061
PHOTORECONNAISSANCE
Development of nose structure of a reconnaissance container for a supersonic jet aircraft
[MBB-LME-242-S-PUB-0451] p 3679 N93-31046
PHOTOSPHERE
The solar oscillations investigation: Michelson Doppler imager p 3867 N93-31345
Photospheric abundances p 3878 N93-31408
First ionization potential fractionation p 3878 N93-31411
Spectral classification with the International Ultraviolet Explorer: An atlas of B-type spectra
[NASA-RP-1312] p 3861 N93-31737
PHOTOVOLTAGES
Photoconductivity and photovoltage generation in novel photocrosslinkable nonlinear optical polymers
[AD-A265780] p 3750 N93-32417
PHOTOVOLTAIC CONVERSION
Large-area, triple-junction a-Si alloy production scale-up
[DE93-010007] p 3750 N93-32177
PHYSICAL CHEMISTRY
Dehydroxylated clay silicates on Mars: Riddles about the Martian regolith solved with ferrian saponites p 3862 N93-31937
PHYSICAL EXAMINATIONS
Biological parameters and cardiovascular risk factors with the flying personnel of the Belgian Armed Forces p 3781 N93-32260
Changes in some lifestyle parametres in Norwegian pilots as students, and after 6 and 12 years of service p 3781 N93-32261
PHYSICAL EXERCISE
Daily exercise routines p 3689 N93-31455
The lifestyle and dietary consumption patterns of United States Air Force aviators within air training command at Randolph Air Force Base, Texas p 3780 N93-32257
Objective improvements obtained by control of diet and physical training in Spanish Air Force fighter pilots p 3780 N93-32258
PHYSICAL FITNESS
Changes in some lifestyle parametres in Norwegian pilots as students, and after 6 and 12 years of service p 3781 N93-32261
PHYSICAL OPTICS
An acoustic scattering code
[AD-A265863] p 3816 N93-32316
PHYSICS
Temporal and spatial analysis in knowledge-based physics problem-solving p 3814 N93-31651
PHYSIOLOGICAL EFFECTS
Effects on health of noise disturbances due to air traffic p 3753 N93-31929
Survey of smoking habits in the Spanish Air Force p 3781 N93-32262
Human factors and the safety of flights: The importance of the management of sleep p 3782 N93-32267
PHYSIOLOGICAL FACTORS
Cardiovascular risk factors in an Italian Air Force population: Preliminary report p 3775 N93-32252
Nutritional and lifestyle status of 50 pilots of the Portugese Air Force p 3780 N93-32255
Biological parameters and cardiovascular risk factors with the flying personnel of the Belgian Armed Forces p 3781 N93-32260
PHYSIOLOGICAL RESPONSES
Trial of emergency ration of the Spanish Air Force p 3778 N93-32247
Torsional vestibulo-ocular reflex measurements for identifying otolith asymmetries possibly related to space motion sickness susceptibility
[NASA-CR-193304] p 3774 N93-32364
PHYSIOLOGICAL TESTS
Daily exercise routines p 3689 N93-31455
PHYSIOLOGY
Melatonin, the pineal gland, and circadian rhythms
[AD-A264099] p 3772 N93-31061
An annotated bibliography of research involving women, conducted at the US Army Research Institute of Environmental Medicine
[AD-A265497] p 3773 N93-31917
Geochemical, genetic, and physiological control of pollutant biodegradation
[AD-A264106] p 3753 N93-32027
PIEZOELECTRIC GAGES
Feasibility of piezoresistive pressure sensors with polycrystalline silicon gauges
[LAAS-92324] p 3728 N93-31127
PIEZOELECTRIC TRANSDUCERS
Sealed acoustical element using conductive epoxy
[AD-D015736] p 3730 N93-32208
PIGMENTS
Effect of DCB extraction on Mossbauer and spectral data for a Hawaiian palagonitic soil (PN-9): Iden tification of pigmentary phases p 3864 N93-31950
Epoxy self-priming topcoats
[AD-D015737] p 3711 N93-32209
PILOT PERFORMANCE
Computer-generated parallel tests for aptitude measurement in the selection of aviation operators
[DLR-FB-92-29] p 3775 N93-31229
The test memorization of symbols and numbers: A computer generated test for visual sensitivity p 3775 N93-31233
The concentration loading test system: A computer generated process for acquisition of attentiveness control p 3776 N93-31235
The aircraft position tests: A computer generated process for acquisition of spatial orientation capability p 3776 N93-31236
The PARAT tests as examination system p 3776 N93-31238
Nutrition, Metabolic Disorders and Lifestyle of Aircrew
[AGARD-CP-533] p 3777 N93-32240
Nutritional assessment of United States tactical air command pilots p 3778 N93-32242
Changes in food and energy intake in military aircrew p 3778 N93-32246
Idiopathic Reactive Hypoglycemia in a population of healthy trainees of an Italian Air Force military school p 3779 N93-32248
Cardiovascular Risk Factors (CVRF) in Spanish pilots with coronary artery disease demonstrated by angiographic studies p 3775 N93-32253
Results and management of pathological lipoprotein concentrations and other cardiovascular risk factors in military pilots of the German Federal Armed Forces p 3775 N93-32254
Nutritional and lifestyle status of 50 pilots of the Portugese Air Force p 3780 N93-32255
The lifestyle and dietary consumption patterns of United States Air Force aviators within air training command at Randolph Air Force Base, Texas p 3780 N93-32257
Objective improvements obtained by control of diet and physical training in Spanish Air Force fighter pilots p 3780 N93-32258
Survey of smoking habits in the Spanish Air Force p 3781 N93-32262
The effects of an antijet lag diet p 3781 N93-32263
Subjective mood and fatigue of C-141 crew during Desert Storm p 3782 N93-32264
C-141 aircrew sleep and fatigue during the Persian Gulf conflict p 3782 N93-32265
Digital flight data as a measure of pilot performance associated with fatigue from continuous operations during the Persian Gulf conflict p 3782 N93-32268
Effects of caffeine on mental performance and mood: Implications for aircrew members p 3783 N93-32269
PILOT PLANTS
Study on new biomass energy systems
[DE93-768470] p 3749 N93-32057
PILOT SELECTION
Computer-generated parallel tests for aptitude measurement in the selection of aviation operators
[DLR-FB-92-29] p 3775 N93-31229
Phases of the project development and examination methodologies p 3775 N93-31231
The position test: A computer generated process for acquisition of inductive logic thinking p 3775 N93-31232
The test memorization of symbols and numbers: A computer generated test for visual sensitivity p 3775 N93-31233
The clearance test: A computer generated process for acquisition of auditive short term sensitivity p 3776 N93-31234
The concentration loading test system: A computer generated process for acquisition of attentiveness control p 3776 N93-31235
The aircraft position tests: A computer generated process for acquisition of spatial orientation capability p 3776 N93-31236
The PARAT tests as examination system p 3776 N93-31238
Abridged procedural guide to aircrew anthropometric accommodation assessment
[AD-A265220] p 3777 N93-32006
PILOT TRAINING
Background and objectives of the PARAT program p 3775 N93-31230
Mandatory multi-engined training syllabus
[CAP-601] p 3776 N93-31729
PINEAL GLAND
Melatonin, the pineal gland, and circadian rhythms
[AD-A264099] p 3772 N93-31061
PIONS
Pion multiplicity as a probe of the deconfinement transition in heavy-ion collisions
[DE93-608484] p 3817 N93-31059
Some outstanding issues in pion scattering at energies above the (delta) resonance
[DE93-012747] p 3822 N93-32300
PIPE FLOW
Study of pipe friction reduction materials for gas transportation.
[PB93-189181] p 3724 N93-31438
A rapid-distortion-theory turbulence model for developed unsteady wall-bounded flow
[NASA-TM-106249] p 3727 N93-32199
Active control of flow induced resonance in continuous corrugated tubes
[AD-A265782] p 3727 N93-32310
PIPELINES
GRI proceedings on the Workshop on Plastic Pipe Research Results
[PB93-190460] p 3708 N93-31211
Long-term reliability of gas pipeline repairs by reinforced composites. Annual report, July 1991-June 1992
[PB93-188647] p 3700 N93-31334
Study of pipe friction reduction materials for gas transportation.
[PB93-189181] p 3724 N93-31438
PIPES (TUBES)
Study of pipe friction reduction materials for gas transportation.
[PB93-189181] p 3724 N93-31438
Axial and torsional fatigue behavior of a cobalt-base alloy p 3697 N93-31582
The development of detection technique for fatigue crack due to thermal stratification phenomena in RCS piping
[DE93-605749] p 3740 N93-31823
Active control of flow induced resonance in continuous corrugated tubes
[AD-A265782] p 3727 N93-32310
PIXELS
SeaWiFS Technical Report Series. Volume 4: An analysis of GAC sampling algorithms: A case study
[NASA-TM-104566-VOL-4] p 3771 N93-32360
PLANE WAVES
Free Maxwell equations, Dirac equation, and non-dispersive De Broglie wave packets
[DE93-609848] p 3832 N93-31908
PLANETARY BOUNDARY LAYER
The structure of the dayside boundary layer between the Venus ionosphere and the shocked solar wind p 3853 N93-31678
ULF/ELF electromagnetic waves associated with the quasiperpendicular Earth's bow shock crossings p 3827 N93-31690
Can ULF fluctuations observed at the magnetopause play a role in anomalous diffusion? p 3855 N93-31693
Exploring the magnetospheric boundary layer p 3855 N93-31694
PLANETARY COMPOSITION
Calculated mineral precipitation upon evaporation of a model Martian groundwater near 0 C p 3862 N93-31940
On the weathering of Martian igneous rocks p 3862 N93-31941
Location of nanophase Fe-oxides in palagonitic soils: Implication for Martian pigments p 3863 N93-31943
Implications of isotopic compositions of N and Ne in the Martian atmosphere to temporal evolution of its atmosphere and regolith p 3864 N93-31947

PLANETARY CRUSTS
Composition of weakly altered Martian crust: Clues from imaging spectroscopy p 3865 N93-31952
Chemical transport during formation and alteration of Martian impact and volcanic deposits p 3865 N93-31953

PLANETARY EVOLUTION
MSATT Workshop on Chemical Weathering on Mars [NASA-CR-193209] p 3861 N93-31933
The mineralogy and formation processes of Mars soil p 3861 N93-31934
Martian weathering/alteration scenarios from spectral studies of ferric and ferrous minerals p 3862 N93-31935
Effects of the chemical environment on the spectroscopic properties of clays: Applications for Mars p 3862 N93-31936
Dehydroxylated clay silicates on Mars: Riddles about the Martian regolith solved with ferrian saponites p 3862 N93-31937
The fate of iron on Mars: Mechanism of oxidation of basaltic minerals to ferric-bearing assemblages p 3862 N93-31938
Implications for volcanogenic volatile release on the weathering of Mars p 3862 N93-31939

PLANETARY GEOLOGY
The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop [NASA-CP-3222] p 3758 N93-31878
Lithology and chronology of ice-sheet fluctuations (magnetic susceptibility of cores from the western Ross Sea) p 3759 N93-31880
MSATT Workshop on Chemical Weathering on Mars [NASA-CR-193209] p 3861 N93-31933
The mineralogy and formation processes of Mars soil p 3861 N93-31934
Martian weathering/alteration scenarios from spectral studies of ferric and ferrous minerals p 3862 N93-31935
Effects of the chemical environment on the spectroscopic properties of clays: Applications for Mars p 3862 N93-31936
Dehydroxylated clay silicates on Mars: Riddles about the Martian regolith solved with ferrian saponites p 3862 N93-31937
The fate of iron on Mars: Mechanism of oxidation of basaltic minerals to ferric-bearing assemblages p 3862 N93-31938
Implications for volcanogenic volatile release on the weathering of Mars p 3862 N93-31939
On the weathering of Martian igneous rocks p 3862 N93-31941
An unusual spectral unit in West Candor Chasma: Evidence for hydrothermal or aqueous alteration? p 3863 N93-31942
Aqueous geochemistry on Mars: Possible clues from salts and clays in SNC meteorites p 3863 N93-31944
Effect of purity on adsorption capacities of a Mars-like clay mineral at different pressures p 3863 N93-31945
Low-temperature formation of magnetic iron oxides p 3863 N93-31946
Implications of isotopic compositions of N and Ne in the Martian atmosphere to temporal evolution of its atmosphere and regolith p 3864 N93-31947
Composition of weakly altered Martian crust: Clues from imaging spectroscopy p 3865 N93-31952
Chemical transport during formation and alteration of Martian impact and volcanic deposits p 3865 N93-31953
Using the Viking biology experimental results to obtain chemical information about Martian regolith p 3865 N93-31955
Chemical modeling constraints on Martian surface mineralogies formed in an early, warm, wet climate, and speculations on the occurrence of phosphate minerals in the Martian regolith p 3865 N93-31956
Infrared optical properties of Mars soil analog materials: Palagonites p 3866 N93-31957
The Martian ocean: First acid, then alkaline p 3866 N93-31958
Experimental investigation of carbonate formation on Mars p 3866 N93-31959
Weathering processes implied from analysis of small Martian avalanche chutes p 3866 N93-31960
Geochemistry and setting of Martian weathering: The Lafayette meteorite p 3866 N93-31961
Attempts to comprehend Martian surface processes through interpretation of the oxygen isotopic compositions of carbonates in SNC meteorites p 3867 N93-31962

PLANETARY IONOSPHERES
The structure of the dayside boundary layer between the Venus ionosphere and the shocked solar wind p 3853 N93-31678

PLANETARY MAGNETOSPHERES
Magnetospheric convection and current system in the dayside polar cap p 3856 N93-31700

PLANETARY MAGNETOTAILS
Energetic particles (greater than 34 KeV - 3.2 MeV) in the deep Martian magnetotail (X = 15.5 R(sub M)), modeling of the Martian bow shock and the influence of low solar wind pressure on Mars as an obstacle p 3855 N93-31691
Collisionless magnetotail reconnection and substorms p 3856 N93-31698
Observation of particle bursts in the tail of planet Mars onboard the Phobos 2 spacecraft p 3856 N93-31699

PLANETARY MAPPING
An unusual spectral unit in West Candor Chasma: Evidence for hydrothermal or aqueous alteration? p 3863 N93-31942

PLANETARY NEBULAE
Molecules in the envelope of planetary nebulae with the example of CO-envelope of M2-9 [ETN-93-94203] p 3851 N93-31050

PLANETARY ORBITS
System study of tether technology with particular consideration of transport utilization possibilities in space transportation [ILR-MITT-270(1992)] p 3685 N93-31207

PLANETARY RADIATION
Analysis of Uranian radio emissions, Uranus Data Analysis Program (UDAP) [NASA-CR-193524] p 3882 N93-32222

PLANETARY SURFACES
Planetary rover developments at JPL p 3737 N93-32115

PLANNING
Massively parallel support for a case-based planning system p 3797 N93-32135

PLASMA ACCELERATION
Energetic particle analyser ERNE p 3869 N93-31354
A model for coronal streamer observations using the SOHO coronagraph instrumentation p 3870 N93-31361
Observations of the solar corona with a high resolution EUV imaging spectrograph p 3875 N93-31390
Energetic particle observations and the abundances of elements in the solar corona p 3878 N93-31410
Radiative preheat in strongly coupled, laser accelerated plasmas [AD-A265442] p 3826 N93-32020

PLASMA ARC WELDING
Gas arc constriction for plasma arc welding [NASA-CASE-MFS-28844-1] p 3734 N93-31292

PLASMA BUBBLES
The effects of magnetic storm phases on F-layer irregularities from auroral to equatorial latitudes [AD-A264908] p 3764 N93-32094

PLASMA COMPOSITION
Application of the SAHA equation to high temperature (greater than or equal to 6000 K) rocket exhaust [AD-A264004] p 3692 N93-31291
Abundance determination in the quiet corona p 3877 N93-31407
Solar wind abundances from Ulysses p 3878 N93-31409
Energetic particle observations and the abundances of elements in the solar corona p 3878 N93-31410
Effects of hydrogen and electron diffusion on trace species diffusion in the solar atmosphere p 3878 N93-31413
Solar wind heavy ions and proton/alpha particle relations observed onboard the Prognoz 7 satellite p 3879 N93-31414
Coronal abundances in solar active regions measured by the Solar Maximum Mission flat crystal spectrometer p 3879 N93-31416

PLASMA DENSITY
An investigation of methods for improving models of ionospheric plasma-density irregularities and radio-frequency scintillation [AD-A264156] p 3756 N93-31062
Observational constraints on coronal hole density model p 3871 N93-31364
Viking observations of electric fields p 3858 N93-31712

PLASMA DIAGNOSTICS
UVCS: The ultraviolet coronograph spectrometer for SOHO p 3868 N93-31349
Streamer eclipse observations p 3869 N93-31357
Microinstabilities in high-power MPD systems: Preliminary diagnostics [AD-A265415] p 3826 N93-32047
Diagnostics of magnetic substorms using satellite observations of magnetic pulsations [AD-A264300] p 3764 N93-32084
Investigation of PACVD protective coating processes using advanced diagnostics techniques [DE93-013978] p 3711 N93-32307
Measurements and analysis of the equivalent circuit of the GEC RF Reference Cell [DE93-013498] p 3718 N93-32425

PLASMA DIFFUSION
Kinetic nonlinear electron-ion two stream instability in field-free isothermal plasma [DE93-608571] p 3826 N93-31668
Plasma transport through magnetic boundaries p 3827 N93-31692

PLASMA DRIFT
Viking observations of electric fields p 3858 N93-31712

PLASMA DYNAMICS
Studies of global ionospheric electrodynamics [AD-A265033] p 3764 N93-31997
Microinstabilities in high-power MPD systems: Preliminary diagnostics [AD-A265415] p 3826 N93-32047

PLASMA FOCUS
Computer simulation of energy profiles in a plasma focus device [DE93-608560] p 3826 N93-31673

PLASMA HEATING
Origin of the solar wind and coronal mass ejections p 3856 N93-31702

PLASMA INTERACTIONS
The interaction of a moving spacecraft with the ionosphere: Current collection and wake structure p 3688 N93-31157
Radiation from a dipole antenna into an inhomogeneous compressible and nonlinear space-plasma [ESA-TT-1261] p 3716 N93-31341
Morphology of coronal loop interactions p 3873 N93-31379
Si atomic layer epitaxy based on Si2H6 and remote He plasma bombardment [DE93-011674] p 3830 N93-32183

PLASMA LAYERS
Plasma sprayed ceramic thermal barrier coating for NiAl-based intermetallic alloys [NASA-CASE-LEW-15535-1] p 3705 N93-31294
Multicomponent double layers [TRITA-ALP-92-03] p 3825 N93-31542
The dynamics and stability of weak double layers [TRITA-ALP-92-02] p 3825 N93-31626
Studies of global ionospheric electrodynamics [AD-A265033] p 3764 N93-31997

PLASMA OSCILLATIONS
A new method for measuring the speed of the bow shock p 3854 N93-31687

PLASMA PHYSICS
The dynamics and stability of weak double layers [TRITA-ALP-92-02] p 3825 N93-31626
Study of the Solar-Terrestrial System [ESA-SP-346] p 3852 N93-31674
Magnetic field reconnection at the dayside magnetopause p 3855 N93-31696

PLASMA PRESSURE
Temperature dependent morphology of untwisted coronal loops p 3875 N93-31393

PLASMA SHEATHS
Computer simulation of energy profiles in a plasma focus device [DE93-608560] p 3826 N93-31673

PLASMA SPECTRA
Energetics of ULF/ELF plasma waves in the solar wind and outer Earth's magnetosphere p 3826 N93-31689
ULF/ELF electromagnetic waves associated with the quasiperpendicular Earth's bow shock crossings p 3827 N93-31690

PLASMA SPRAYING
Carbon diffusion in uncoated and titanium nitride coated iron substrates during microwave plasma assisted chemical vapor deposition of diamond [DE93-608934] p 3708 N93-31174
Plasma sprayed ceramic thermal barrier coating for NiAl-based intermetallic alloys [NASA-CASE-LEW-15535-1] p 3705 N93-31294
Turntable mechanism [NASA-CASE-MFS-28522-1] p 3734 N93-31313
Microstructural studies of ceramic thermal carrier coatings; how it influences coatings thermomechanical resistance [ONERA-NT-1992-9] p 3709 N93-31597

PLASMA TEMPERATURE
Measuring electron temperature in the extended corona p 3880 N93-31422

PLASMA TURBULENCE
Kinetic nonlinear electron-ion two stream instability in field-free isothermal plasma [DE93-608571] p 3826 N93-31668
Ion acceleration at parallel shocks: Self-consistent plasma simulations p 3826 N93-31683
Plasma wave phenomena observed at interplanetary shocks by the Ulysses URAP experiment p 3826 N93-31684

ULF/ELF electromagnetic waves associated with the quasiperpendicular Earth's bow shock crossings
p 3827 N93-31690

PLASMA WAVES
Plasma wave phenomena observed at interplanetary shocks by the Ulysses URAP experiment
p 3826 N93-31684
A new method for measuring the speed of the bow shock p 3854 N93-31687
Energetics of ULF/ELF plasma waves in the solar wind and outer Earth's magnetosphere p 3826 N93-31689
The implementation of the digital wave processor for the ESA/NASA Cluster mission p 3858 N93-31708
An investigation of dayside FTE's observed by the AMPTE-UKS satellite p 3858 N93-31709
Auroral Cluster: Science objectives and measurement strategies p 3858 N93-31710
Plasma waves interferometry on Cluster
p 3827 N93-31714
On the Bernstein modes generation in solar post-flare loops p 3859 N93-31718
Optically guided laser wakefield acceleration
[AD-A265441] p 3732 N93-32019

PLASMA-ELECTROMAGNETIC INTERACTION
Nonlinear radiation of waves at combination frequencies due to radiation-surface wave interaction in plasmas
[DE93-608570] p 3825 N93-31667

PLASMAS (PHYSICS)
Intuitive approach to modified gyrokinetic equation and numerical confirmation
[DE93-604671] p 3812 N93-31083
Are there missing convective currents?
[DE93-604672] p 3825 N93-31084
Tokamak plasma shape identification based on the boundary integral equations
[DE93-715383] p 3825 N93-31097
New edge magnetoplasmon for a two-dimensional electron gas in a ring geometry
[DE93-608737] p 3825 N93-31164
Observation of particle bursts in the tail of planet Mars onboard the Phobos 2 spacecraft p 3856 N93-31699
The effects of magnetic storm phases on F-layer irregularities from auroral to equatorial latitudes
[AD-A264908] p 3764 N93-32094
Investigation of PACVD protective coating processes using advanced diagnostics techniques
[DE93-013978] p 3711 N93-32307
Measurements and analysis of the equivalent circuit of the GEC RF Reference Cell
[DE93-013498] p 3718 N93-32425

PLASMONS
New edge magnetoplasmon for a two-dimensional electron gas in a ring geometry
[DE93-608737] p 3825 N93-31164

PLASTIC PROPERTIES
Some aspects of invariant theory in plasticity. Part 2: Constitutive relations for perfectly locking materials. Comments on perfectly plastic solids
p 3742 N93-32321

PLATE THEORY
An efficient model for coupling structural vibrations with acoustic radiation
[NASA-CR-191452] p 3816 N93-31868

PLATES (STRUCTURAL MEMBERS)
Impact response of laminated plates subjected to transverse loading p 3740 N93-31645

PLATINUM
Availability of platinum and platinum-group metals
[PB93-189496] p 3743 N93-31115

PLENUM CHAMBERS
Gas arc constriction for plasma arc welding
[NASA-CASE-MFS-28844-1] p 3734 N93-31292

PLOTTERS
A plotting system for three-dimensional oblique coordinates (triangular mesh) of CITATION
[DE92-526848] p 3792 N93-32185

PLOTTING
A plotting system for three-dimensional oblique coordinates (triangular mesh) of CITATION
[DE92-526848] p 3792 N93-32185

PLUMES
Observations of stationary radio sources: Coronal polar plumes? p 3871 N93-31365
OPAD 1991 p 3693 N93-31559
Four dimensional reconstruction and analysis of plume images p 3694 N93-31561
Radiation/convection coupling in rocket motor and plume analysis
[NASA-CR-193288] p 3698 N93-31845

PLUTONIUM 239
Integration of measurements with atmospheric dispersion models: Source term estimation for dispersal of (239)Pu due to non-nuclear detonation of high explosive
[DE93-012550] p 3766 N93-32295

PLY ORIENTATION
Design of multiple-ply laminated composite tapered beams
[NASA-TM-108411] p 3700 N93-31650

PNEUMATICS
Electropneumatic actuator, phase 1
[PB93-174951] p 3720 N93-31876

POINTS (MATHEMATICS)
Point interactions on bounded domains
[REPT-92-97] p 3807 N93-31654

POISSON DENSITY FUNCTIONS
Blocking probabilities in a loss system with arrivals in geometrically distributed batches and heterogeneous service requirements
[MEMO-1074] p 3812 N93-32392

POLAR CAPS
Magnetospheric convection and current system in the dayside polar cap p 3856 N93-31700

POLAR CUSPS
Distinct ion population in the polar cusp: Possible signature of transient reconnection
p 3766 N93-31680

POLAR REGIONS
High-latitude electric field studies using DMSP data
[AD-A265032] p 3763 N93-31996
The effects of magnetic storm phases on F-layer irregularities from auroral to equatorial latitudes
[AD-A264908] p 3764 N93-32094

POLARIMETERS
AOTF enhancements for a space-based spectropolarimeter
[NASA-CR-193290] p 3691 N93-31040

POLARIMETRY
Polametric passive remote sensing of ocean surface
[AD-A265874] p 3746 N93-32173

POLARITONS
Nonlinear response function for two-phonon polaritons
[DE93-608692] p 3817 N93-31099

POLARIZED ELECTROMAGNETIC RADIATION
Nonlinear radiation of waves at combination frequencies due to radiation-surface wave interaction in plasmas
[DE93-608570] p 3825 N93-31667

POLARIZED LIGHT
The solar corona structures as inferred from July 11, 1991 total solar eclipse observation
p 3872 N93-31372
Development of a large field-of-view KD potassium di-deuterium phosphate modulator: Center Director's Discretionary Fund
[NASA-TM-108410] p 3824 N93-32378

POLARIZED RADIATION
Proceedings of the Workshop on Application of Circularly Polarized X Rays in the Region of 1 to 8 keV
[DE93-704276] p 3823 N93-31165
The July 11, 1991 solar corona observed in polarized white light: Preliminary results p 3879 N93-31417

POLARONS
Nonlinear response function for two-phonon polaritons
[DE93-608692] p 3817 N93-31099

POLICIES
RCRA implementation plan, FY 1993
[PB93-176956] p 3752 N93-31877

POLLUTION CONTROL
In-situ bioventing: Two US EPA and Air Force sponsored field studies
[PB93-194231] p 3754 N93-32089
Proceedings: 1991 SO2 Control Symposium, volume 2, sessions 4 and 5A
[PB93-196103] p 3754 N93-32090
Proceedings: 1991 SO2 Control Symposium, volume 3, sessions 5B and 6
[PB93-196111] p 3755 N93-32091
Proceedings: 1991 SO2 Control Symposium, volume 4, session 7
[PB93-196129] p 3755 N93-32092
Proceedings: 1991 SO2 Control Symposium, volume 5, session 8
[PB93-196137] p 3755 N93-32093
Proceedings of the 1991 SO2 Control Symposium, volume 1
[PB93-196095] p 3755 N93-32168

POLLUTION MONITORING
Air quality studies in Albuquerque, New Mexico
[PB93-190817] p 3751 N93-31212
Two new gas standards programs at the National Institute of Standards and Technology
[PB93-191427] p 3751 N93-31816
Investigation of atmospheric aerosols and gases at an east China station
[PB93-184539] p 3752 N93-31831
Methodology to apportion ambient air measurements to investigate potential effects on air quality near waste incinerators
[PB93-191393] p 3754 N93-32088

POLLUTION TRANSPORT
Three-dimensional modeling of pollutant transport in surface waters
[PB93-190627] p 3751 N93-31203
Preferential flow effects on chemical transport and retardation in soils
[PB93-190668] p 3723 N93-31204
Integration of measurements with atmospheric dispersion models: Source term estimation for dispersal of (239)Pu due to non-nuclear detonation of high explosive
[DE93-012550] p 3766 N93-32295
Tests on semi-Lagrangian transport and interpolation
[CWI-NM-R921M] p 3756 N93-32393

POLYCHLORINATED BIPHENYLS
Chemical dehalogenation treatment: Base-Catalyzed Decomposition Process (BCDP)
[PB93-182939] p 3751 N93-31432

POLYCRYSTALS
Computer simulation of 3D material microstructure and its application in the determination of mechanical behavior of polycrystalline materials and engineering structures
p 3708 N93-31134

POLYHEDRONS
Extracting projective information from single views of 3D point sets
[OUEL-1927/92] p 3785 N93-31151

POLYMER BLENDS
Surface degradauon of polymeric materials
[NPL-DMM(A)-75] p 3709 N93-31323

POLYMER CHEMISTRY
Ion exchange polymers and method for making
[NASA-CASE-LEW-15576-1] p 3709 N93-31316

POLYMER PHYSICS
Surface degradation of polymeric materials
[NPL-DMM(A)-75] p 3709 N93-31323
Liquid-crystalline main-chain polymers with flexible side chains: Synthesis, structure, processing and properties of poly(p-phenylene terephthalate)s with alkoxy side chains
[ETN-93-94041] p 3709 N93-31520

POLYMERIC FILMS
Surface degradation of polymeric materials
[NPL-DMM(A)-75] p 3709 N93-31323
Cerenkov type phase-matched second harmonic generation in polymeric channel waveguides
[AD-A265787] p 3710 N93-31801
Functionalized polymeric materials for electronics and optics
[AD-A265788] p 3710 N93-31802
Photoconductivity and photovoltage generation in novel photocrosslinkable nonlinear optical polymers
[AD-A265780] p 3750 N93-32417

POLYMERS
Chemical effects of ionizing radiations and electron beam in polymers: Industrial uses
[DE93-609337] p 3708 N93-31179
Ion exchange polymers and method for making
[NASA-CASE-LEW-15576-1] p 3709 N93-31316
Commissioning and operating instructions of one pint (US) mixer
[MRL-TN-634] p 3713 N93-31639
Infinite volume extrapolations of finite cluster calculations. How correct are these?
[AD-A265648] p 3809 N93-32170

POLYMORPHISM
NTO polymorphs
[DE93-005451] p 3712 N93-31186

POLYNOMIALS
Least squares orthogonal polynomial approximation in several independent variables
[DE93-609832] p 3802 N93-31180
The generic dimension of a minimal realization of an AR-system
[REPT-92-82] p 3805 N93-31492
Uniqueness of limit cycles in polynomial systems with algebraic invariants
[REPT-92-72] p 3805 N93-31505
Some new results for chain-sequence polynomials
[MEMO-1081] p 3806 N93-31515
Sobolev-type orthogonal polynomials with a small number of real zeros
[REPT-92-64] p 3806 N93-31549
Existence and uniqueness of limit cycles for a special system of differential equations on the plane
[REPT-92-63] p 3806 N93-31550

POLYPHENYLS
Liquid-crystalline main-chain polymers with flexible side chains: Synthesis, structure, processing and properties of poly(p-phenylene terephthalate)s with alkoxy side chains
[ETN-93-94041] p 3709 N93-31520

POLYTETRAFLUOROETHYLENE
Determination of the oxidative stability of perfluoropolyalkyl ethers and correlation with chemical structure
[NASA-TM-106223] p 3712 N93-32367

POLYVINYL ALCOHOL
Ion exchange polymers and method for making
[NASA-CASE-LEW-15576-1] p 3709 N93-31316
POLYVINYL CHLORIDE
Performance of an impact loaded sandwich plate
[VTT-JULK-767] p 3702 N93-32388
POMERANCHUK THEOREM
Nonlinear Pomeron and Odderon in elastic re-scatterings
[DE93-608326] p 3818 N93-31241
Supercritical pomeron and spin effects in meson-nucleon scattering at high energy
[DE93-608327] p 3818 N93-31242
Odderon dominance in dipole model of hadron elastic scattering
[DE93-608329] p 3819 N93-31243
POMERONS
Nonlinear Pomeron and Odderon in elastic re-scatterings
[DE93-608326] p 3818 N93-31241
Supercritical pomeron and spin effects in meson-nucleon scattering at high energy
[DE93-608327] p 3818 N93-31242
Odderon dominance in dipole model of hadron elastic scattering
[DE93-608329] p 3819 N93-31243
PONDEROMOTIVE FORCES
Optically guided laser wakefield acceleration
[AD-A265441] p 3732 N93-32019
PONTRYAGIN PRINCIPLE
Optimal control problems for parabolic boundary control systems p 3800 N93-32216
POPULATION INVERSION
Effects of atomic coherence on multi-level lasing systems p 3731 N93-31133
POROSITY
Tetragonal zirconia ceramics in Zr O2-Ce O2 system (CP): Preparation, characterization, and mechanical properties
[DE93-606833] p 3708 N93-31089
Novel strategies for the synthesis of methane adsorbents with controlled porosity and high surface area
[PB93-189967] p 3702 N93-31209
The effect of porosity and gamma-gamma' eutectic content on the low cycle fatigue behavior of hydrogen-charged PWA-1480 p 3696 N93-31576
Advanced alternate planar geometry solid oxide fuel cells
[DE93-000248] p 3721 N93-32174
POROUS MATERIALS
Novel strategies for the synthesis of methane adsorbents with controlled porosity and high surface area
[PB93-189967] p 3702 N93-31209
PORTABLE EQUIPMENT
An overview of PCTE: A basis for a Portable Commo n Tool Environment
[AD-A265202] p 3791 N93-32000
Portable equipment developed to estimate energy expenditure by simultaneous recording of heart rate and body position p 3778 N93-32243
POSITION (LOCATION)
Experimental evaluation of an arrival time difference lightning positioning system
[KNMI-WR-92-01] p 3767 N93-31600
POSITION ERRORS
Experiences with two GPS receivers in northern Europe
[NLR-TP-91168-U] p 3675 N93-31120
Mass balance assessment using GPS p 3761 N93-31892
POSITION INDICATORS
Experimental evaluation of an arrival time difference lightning positioning system
[KNMI-WR-92-01] p 3767 N93-31600
POSITIONING DEVICES (MACHINERY)
Turntable mechanism
[NASA-CASE-MFS-28522-1] p 3734 N93-31313
POSITIVE IONS
Theoretical investigation of electron-positive ion/atom interactions
[DE93-012933] p 3822 N93-32162
POSTURE
Transmission of vibration through the human body to the head: A summary of experimental data
[ISVR-TR-218] p 3774 N93-32237
POTABLE WATER
Utilization of high energy electron beam in the treatment of drinking and waste water
[DE92-642335] p 3783 N93-32406
POTASSIUM ALLOYS
Local order and concentration fluctuations in K-Pb and Rb-Pb alloys
[DE93-606725] p 3704 N93-31093
POTENTIAL FLOW
A continuation method for computing non-linear 3-D free surface flows
[DE93-008704] p 3727 N93-32175
POWDER (PARTICLES)
Tetragonal zirconia ceramics in Zr O2-Ce O2 system (CP): Preparation, characterization, and mechanical properties
[DE93-606833] p 3708 N93-31089
POWER EFFICIENCY
Combinatorial pulse position modulation for power-efficient free-space laser communications
[NASA-TM-106241] p 3717 N93-31856
POWER LINES
Adaptive optics for high power beam lines using diamond crystal monochromators
[DE93-009328] p 3824 N93-31987
PRE-MAIN SEQUENCE STARS
Imaging circumstellar disks around young stars by multi-aperture interferometry p 3847 N93-31766
PREBURNERS
Overview of aerothermodynamic loads definition study p 3697 N93-31583
PRECIPITATION (METEOROLOGY)
Chemistry and acidity of cloud water at Mount Washington, NH
[PB93-190684] p 3767 N93-31206
The 3rd national heavy precipitation workshop
[PB93-186625] p 3767 N93-31329
Determination of the robustness of passive microwave measurements and derivative parameters for use in precipitation discrimination over land
[AD-A265492] p 3768 N93-32008
PRECIPITATION HARDENING
Precipitation hardening of infrared transmitting ZnS ceramics
[AD-A265184] p 3710 N93-31993
PREDICTION ANALYSIS TECHNIQUES
An efficient constrained predictive control algorithm for 2-input systems
[OUEL-1946/92] p 3785 N93-31152
Surface degradation of polymeric materials
[NPL-DMM(A)-75] p 3709 N93-31323
Overview of the fatigue/fracture/life prediction working group program at the Lewis Research Center p 3696 N93-31574
A model for predicting high-temperature fatigue failure of a W/Cu composite p 3696 N93-31579
Examination of the effect of propulsion system performance variables on the life prediction for the SSME Lox Post p 3697 N93-31580
Life extending control: An interdisciplinary engineering thrust p 3697 N93-31581
Analysis of effective thermal conductivity of fibrous materials
[NASA-CR-193242] p 3709 N93-31636
Navier-Stokes computations for kinetic energy projectiles in steady coning motion: A predictive capability for pitch damping
[AD-A264111] p 3726 N93-32028
Satellite motion around an oblate planet: A perturbation solution for all orbital parameters
[AD-A265779] p 3690 N93-32335
Development of a method to predict transonic limit cycle oscillation characteristics of fighter aircraft
[NLR-TP-91359-U] p 3679 N93-32338
PREDICTIONS
Surface degradation of polymeric materials
[NPL-DMM(A)-75] p 3709 N93-31323
PREDICTOR-CORRECTOR METHODS
Parallel Jacobi iteration in implicit step-by-step methods
[CWI-NM-R9218] p 3810 N93-32394
Explicit, high-order Runge-Kutta-Nystroem methods for parallel computers
[CWI-NM-R9219] p 3796 N93-32395
Parallel block predictor-corrector methods of Runge-Kutta type
[CWI-NM-R9220] p 3797 N93-32396
PREPARATION
Phases of the project development and examination methodologies p 3775 N93-31231
The PARAT tests as examination system p 3776 N93-31238
PRESSURE CHAMBERS
Rayleigh-Brillouin scattering for high-pressure gas temperature measurements p 3693 N93-31556
PRESSURE DEPENDENCE
Diffusion coefficients in molten slags
[NPL-DMM(A)-82] p 3703 N93-31603
PRESSURE EFFECTS
On the magnetoresistance of heavy fermion compounds
[DE93-608691] p 3827 N93-31098
Pressure induced topological phase transitions in membranes
[AD-A265212] p 3829 N93-32002
PRESSURE MEASUREMENT
Feasibility of piezoresistive pressure sensors with polycrystalline silicon gauges
[LAAS-92324] p 3728 N93-31127
Heat transfer and pressure measurements for the SSME fuel turbine p 3698 N93-31587
Dynamic response of a transducer mounted at one end of an acoustical cavity
[DE93-012837] p 3816 N93-32301
PRESSURE REDUCTION
Hyperbaric treatment p 3689 N93-31454
PRESSURE SENSORS
Feasibility of piezoresistive pressure sensors with polycrystalline silicon gauges
[LAAS-92324] p 3728 N93-31127
Dynamic response of a transducer mounted at one end of an acoustical cavity
[DE93-012837] p 3816 N93-32301
PRETREATMENT
Microbiological and corrosion analysis of three urine pretreatment regimes with titanium 6A1-4V
[NASA-CR-192575] p 3783 N93-32356
PREVENTION
Prevention of cumulative trauma disorders
[PB93-188332] p 3773 N93-31138
PRIORITIES
An intelligent knowledge system for selection of materials for critical aerospace applications (IKSMAT), phase 2
[AD-A263394] p 3835 N93-31078
The priority inversion problem and real-time symbolic model checking
[AD-A265408] p 3791 N93-32044
PROBABILITY DENSITY FUNCTIONS
Estimation of density functionals
[REPT-92-98] p 3807 N93-31655
Wavefront reconstruction from three dimensional intensity measurements
[DE93-609881] p 3832 N93-31909
PROBABILITY THEORY
Modeling users' behavior and threats for security
[REPT-92-071] p 3811 N93-31476
Structural dynamics: Probabilistic structural analysis methods. Program overview p 3694 N93-31562
Structural reliability methods: Code development status p 3694 N93-31563
Probabilistic load simulation: Code development status p 3694 N93-31564
Probabilistic evaluation of SSME structural components p 3694 N93-31565
Rocketdyne PSAM: In-house enhancement/application p 3694 N93-31566
Commercialization of NESSUS: Status p 3695 N93-31567
Probabilistic structural analysis algorithm development for computational efficiency p 3695 N93-31569
Expert system development for probabilistic load simulation p 3695 N93-31570
Probabilistic fracture finite elements p 3695 N93-31571
Mapping methods for computationally efficient and accurate structural reliability p 3695 N93-31572
Probabilistic simulation of the human factor in structural reliability p 3696 N93-31573
Decision theory for computing variable and value ordering decisions for scheduling problems p 3835 N93-32137
PROBES
An integrated eddy current detection and imaging system on a silicon chip p 3693 N93-31560
PROBLEM SOLVING
Integration and implementation of the automated natural deduction in demonstrators using resolution
[ETN-93-94239] p 3803 N93-31208
Job shop scheduling by local search
[MEMO-COSOR-92-29] p 3834 N93-31510
Temporal and spatial analysis in knowledge-based physics problem-solving p 3814 N93-31651
The priority inversion problem and real-time symbolic model checking
[AD-A265408] p 3791 N93-32044
Generation and exploration of aggregation abstractions for scheduling and resource allocation p 3835 N93-32128
The MICRO-BOSS scheduling system: Current status and future efforts p 3835 N93-32133
Massively parallel support for a case-based planning system p 3797 N93-32135
Integration of domain and resource-based reasoning for real-time control in dynamic environments p 3794 N93-32141

PROCESS CONTROL (INDUSTRY)
Selection by simulation: A work sample approach to the selection of process algebras
[ISBN-9-09-005483-9] p 3811 N93-31618
PRODUCT DEVELOPMENT
Projects within the Center for Advanced Materials
[PB93-175222] p 3699 N93-31870
PRODUCTION COSTS
Antenna size, transmitter power, and solid state transmitter considerations in affordable radar design
[AD-A264397] p 3718 N93-32414
PRODUCTION ENGINEERING
Coordination of production and sales
[ETN-93-94039] p 3834 N93-31518
Statistics of mass production
[AD-A264365] p 3715 N93-31867
The technology base for agile manufacturing
p 3715 N93-32104
PRODUCTION MANAGEMENT
Coordination of production and sales
[ETN-93-94039] p 3834 N93-31518
Statistics of mass production
[AD-A264365] p 3715 N93-31867
PRODUCTION PLANNING
Coordination of production and sales
[ETN-93-94039] p 3834 N93-31518
PROGRAM VERIFICATION (COMPUTERS)
COBOL Compiler Validation System (CCVS 85), user guide, version 4.2
[PB93-163178] p 3785 N93-31112
Building Hadamard matrices in steps of 4 to order 200
[PB93-189835] p 3786 N93-31200
Formal specification and verification of concurrent programs
[AD-A265201] p 3790 N93-31793
The Delfi3 debugger: Notes on the implementation
[REPT-92-106] p 3790 N93-31850
Validation of survivability validation protocols
[AD-A264402] p 3791 N93-32034
The priority inversion problem and real-time symbolic model checking
[AD-A265408] p 3791 N93-32044
Global synchronization algorithms for the Intel iPSC/860
[NASA-CR-193618] p 3793 N93-32361
PROGRAMMING ENVIRONMENTS
The Delfi3 debugger: Notes on the implementation
[REPT-92-106] p 3790 N93-31850
An overview of PCTE: A basis for a Portable Commo n Tool Environment
[AD-A265202] p 3791 N93-32000
An iconic programming language for sensor-based robots p 3793 N93-32098
PERTS: A Prototyping Environment for Real-Time Systems p 3794 N93-32147
Software engineering p 3794 N93-32154
The Knowledge-Based Software Assistant: Beyond CASE p 3794 N93-32156
The enhanced Software Life Cyle Support Environment (ProSLCSE): Automation for enterprise and process modeling p 3794 N93-32158
PROGRAMMING LANGUAGES
On the integration of algebraic and logic languages
[ETN-93-94238] p 3786 N93-31205
A new definition of the subtype relation
[AD-A265548] p 3791 N93-32066
An iconic programming language for sensor-based robots p 3793 N93-32098
Intelligent assistance in scientific data preparation
p 3843 N93-32144
PROJECT PLANNING
NASA aerospace pyrotechnically actuated systems: Program plan
[NASA-TM-109226] p 3712 N93-31308
Maglev program test plan
[PB93-154904] p 3736 N93-32194
PROJECTILES
Navier-Stokes computations for kinetic energy projectiles in steady coning motion: A predictive capability for pitch damping
[AD-A264111] p 3726 N93-32028
Technique for measuring the spin rate of kinetic energy projectiles
[AD-A264114] p 3717 N93-32031
Single crystal tungsten kinetic energy penetrators
[DE93-012570] p 3706 N93-32296
The development of a tungsten heavy alloy that fails by an adiabatic shear mechanism, phase 1
[AD-A265867] p 3707 N93-32318
PROLOG (PROGRAMMING LANGUAGE)
Reasoning about termination of PROLOG programs
[CT-91-12] p 3787 N93-31479
PROPANE
Cost-effectiveness analysis of txDOT LPG fleet conversion, volume 1
[PB93-186492] p 3712 N93-31326
Cost-effectiveness analysis of txDOT LPG fleet conversion, volume 2
[PB93-186500] p 3713 N93-31327
PROPELLANT TANKS
Reusable cryogenic liquid rocket propellant tank
[NASA-CASE-LAR-14172-1] p 3692 N93-31295
PROPELLER EFFICIENCY
On the verification of a theory for sculling propulsion
[ETN-93-94040] p 3725 N93-31519
PROPELLER NOISE
Modal measurements and propeller field excitation on acoustic full scale mockup of SAAB 340 aircraft
[FFA-TN-1992-08] p 3815 N93-31051
PROPELLERS
On the verification of a theory for sculling propulsion
[ETN-93-94040] p 3725 N93-31519
PROPULSION SYSTEM CONFIGURATIONS
Fatigue in single crystal nickel superalloys
[AD-A265451] p 3706 N93-31795
NASA's progress in nuclear electric propulsion technology
[NASA-TM-106272] p 3698 N93-31858
PROPULSION SYSTEM PERFORMANCE
Inertial electrostatic confinement as a power source for electric propulsion
[NASA-TM-109228] p 3692 N93-31310
Examination of the effect of propulsion system performance variables on the life prediction for the SSME Lox Post p 3697 N93-31580
Fatigue in single crystal nickel superalloys
[AD-A265451] p 3706 N93-31795
PROTECTIVE CLOTHING
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 377)
[NASA-SP-7011(377)] p 3773 N93-31924
PROTECTIVE COATINGS
Plasma sprayed ceramic thermal barrier coating for NiAl-based intermetallic alloys
[NASA-CASE-LEW-15535-1] p 3705 N93-31294
Oxidation resistant overlay coatings for low expansion substrates
[NASA-CASE-LEW-15154-2] p 3708 N93-31300
Microstructural studies of ceramic thermal carrier coatings; how it influences coatings thermomechanical resistance
[ONERA-NT-1992-9] p 3709 N93-31597
Epoxy self-priming topcoats
[AD-D015737] p 3711 N93-32209
Investigation of PACVD protective coating processes using advanced diagnostics techniques
[DE93-013978] p 3711 N93-32307
Evaluation of chemical conversion material (protective coating) exposed to space environmental conditions
[NASA-TM-108416] p 3730 N93-32366
PROTOCOL (COMPUTERS)
Design and implementation strategies
[MEMO-INF-92-57] p 3788 N93-31511
Current state of the mass storage system reference model p 3840 N93-31965
New architectures to reduce I/O bottlenecks in high-performance systems
[DE93-009059] p 3795 N93-31985
Validation of survivability validation protocols
[AD-A264402] p 3791 N93-32034
Petite amateur naval satellite spacecraft digital control system: A hardware design
[AD-A265234] p 3690 N93-32061
Data communication network at the ASRM facility
[NASA-CR-193625] p 3686 N93-32236
PROTONS
Influence of interplanetary shocks on approximately 10 MeV protons: A phenomenological classification
p 3854 N93-31686
PROTOSTARS
Structure, evolution, and stability of rotating protostars
p 3852 N93-31153
Submillimetre line observations of molecular clouds
p 3848 N93-31772
PROTOTYPES
Integrated access to distributed databases through intelligent interfaces p 3837 N93-31218
Assessment of a human computer interface prototyping environment
[NASA-CR-192612] p 3784 N93-31849
RATLER: Robotic All-Terrain Lunar Exploration Rover
p 3737 N93-32117
PERTS: A Prototyping Environment for Real-Time Systems p 3794 N93-32147
PROXIMITY
Proximity operations in space station environment
p 3689 N93-31449
UK airmisses involving commercial air transport, September - December 1991
[ETN-93-93930] p 3674 N93-32409
PSYCHOLOGICAL EFFECTS
Effects on health of noise disturbances due to air traffic p 3753 N93-31929
PSYCHOLOGICAL FACTORS
Nutritional and lifestyle status of 50 pilots of the Portugese Air Force p 3780 N93-32255
PSYCHOLOGICAL TESTS
Computer-generated parallel tests for aptitude measurement in the selection of aviation operators
[DLR-FB-92-29] p 3775 N93-31229
Background and objectives of the PARAT program
p 3775 N93-31230
Phases of the project development and examination methodologies p 3775 N93-31231
The position test: A computer generated process for acquisition of inductive logic thinking
p 3775 N93-31232
The test memorization of symbols and numbers: A computer generated test for visual sensitivity
p 3775 N93-31233
The clearance test: A computer generated process for acquisition of auditive short term sensitivity
p 3776 N93-31234
The concentration loading test system: A computer generated process for acquisition of attentiveness control p 3776 N93-31235
The aircraft position tests: A computer generated process for acquisition of spatial orientation capability
p 3776 N93-31236
The cube rotation test: A computer generated process for acquisition of mental spatial manipulator capability
p 3776 N93-31237
The PARAT tests as examination system
p 3776 N93-31238
PSYCHOMETRICS
Computer-generated parallel tests for aptitude measurement in the selection of aviation operators
[DLR-FB-92-29] p 3775 N93-31229
The position test: A computer generated process for acquisition of inductive logic thinking
p 3775 N93-31232
The test memorization of symbols and numbers: A computer generated test for visual sensitivity
p 3775 N93-31233
The clearance test: A computer generated process for acquisition of auditive short term sensitivity
p 3776 N93-31234
The concentration loading test system: A computer generated process for acquisition of attentiveness control p 3776 N93-31235
The aircraft position tests: A computer generated process for acquisition of spatial orientation capability
p 3776 N93-31236
The cube rotation test: A computer generated process for acquisition of mental spatial manipulator capability
p 3776 N93-31237
PSYCHOPHYSIOLOGY
Selection of personnel for stressful occupations: The potential utility of psychophysiological measures as selection tools
[AD-A264571] p 3776 N93-32011
PUBLIC HEALTH
Air Traffic and Environment
[GSF-BAND-8] p 3752 N93-31925
Effects on health of noise disturbances due to air traffic p 3753 N93-31929
Effects of commercial flight pollution on human health
p 3753 N93-31931
PULSE AMPLITUDE
QUASAR: An interactive program for spectrum analysis in personal computers
[DE93-609814] p 3786 N93-31248
PULSE COMMUNICATION
Petite amateur naval satellite spacecraft digital control system: A hardware design
[AD-A265234] p 3690 N93-32061
PULSE DURATION MODULATION
Pulse-modulated control of switching valves for an electro-hydraulic servo actuator
[DLR-FB-92-18] p 3719 N93-31462
Protection and regulation on direct-direct chopping converters
[CNES-NT-129] p 3719 N93-31475
PULSE POSITION MODULATION
Combinatorial pulse position modulation for power-efficient free-space laser communications
[NASA-TM-106241] p 3717 N93-31856
PULSED LASERS
Investigation of carbon near the graphite-diamond-liquid triple point
[DE93-609052] p 3708 N93-31178
Optically guided laser wakefield acceleration
[AD-A265441] p 3732 N93-32019

PUMP SEALS
Excitation by flows in seals and clearances. Part 1: Introduction: Fluid-structure-interactions in rotordynamics. Part 2: Identification of rotordynamic coefficients of annular seals p 3738 N93-32275
PUMPS
Japan's Sunshine Project
[DE93-768249] p 3749 N93-32053
PYRIDINES
Vibrational overtone spectroscopy of cyclic amines: Pyridine and related compounds
[AD-A265524] p 3704 N93-31919
PYROTECHNICS
NASA aerospace pyrotechnically actuated systems: Program plan
[NASA-TM-109226] p 3712 N93-31308

Q

Q FACTORS
Initial definition of a Knowledge-Based Software Quality Assistant
[AD-A265866] p 3793 N93-32418
QUADRATIC EQUATIONS
Structurally stable quadratic systems without limit cycles
[REPT-92-58] p 3805 N93-31501
Uniqueness of limit cycles in polynomial systems with algebraic invariants
[REPT-92-72] p 3805 N93-31505
QUADRATIC PROGRAMMING
Duality and sensitivity in quadratic optimization over a sphere
[REPT-92-65] p 3804 N93-31470
QUALITY CONTROL
A proposal on the quality of the binary thresholds of a contour detection
[REPT-91-075] p 3806 N93-31544
SeaWiFS technical report series. Volume 10: Modeling of the SeaWiFS solar and lunar observations
[NASA-TM-104566-VOL-10] p 3770 N93-31859
Statistics of mass production
[AD-A264365] p 3715 N93-31867
Initial definition of a Knowledge-Based Software Quality Assistant
[AD-A265866] p 3793 N93-32418
QUANTITATIVE ANALYSIS
Determination of the oxidative stability of perfluoropolyalkyl ethers and correlation with chemical structure
[NASA-TM-106223] p 3712 N93-32367
QUANTUM CHEMISTRY
Metastability in molecules
[AD-A264344] p 3817 N93-31063
Development of practical MO techniques for prediction of the properties and behavior of materials
[AD-A265730] p 3820 N93-31798
QUANTUM CHROMODYNAMICS
2 + 1 gravity without dynamics
[DE92-642587] p 3757 N93-31081
Random walks and a simple chirally invariant lattice Hamiltonian without fermion doubling
[DE93-609920] p 3821 N93-31913
Two jet production in hadron collisions at order alpha(sub s)(sup 3) in QCD
[DE93-010563] p 3822 N93-32159
Novel spin effects in quantum chromodynamics
[DE93-010955] p 3833 N93-32181
QUANTUM ELECTRODYNAMICS
String-like excitations in quantum electrodynamics
[DE92-642593] p 3830 N93-31075
Quantum transport
[AD-A264935] p 3832 N93-32072
QUANTUM MECHANICS
Multiparametric quantum symplectic phase space
[DE93-604081] p 3802 N93-31162
Quantum adiabatic expansion for dynamics in strong magnetic fields
[DE93-609388] p 3831 N93-31226
The three-body problem in the ground-state representation
[DE93-608164] p 3803 N93-31289
Three lectures on quantum groups: Representations, duality, real forms
[DE93-608159] p 3832 N93-31807
Q-deformed conformal superalgebra and its Hopf subalgebras
[DE93-608160] p 3807 N93-31808
Free Maxwell equations, Dirac equation, and non-dispersive De Broglie wave packets
[DE93-609848] p 3832 N93-31908
A unified approach to classical and quantum physics
[DE93-609843] p 3833 N93-32411
QUANTUM THEORY
Quantum spectra and dynamics p 3831 N93-31129
Non-standard representations of the space-time groups and their applications to the dynamical theory of elementary particles
[DE93-608203] p 3818 N93-31240
Information-theoretic outlook of the quantum dissipation problem
[DE93-608162] p 3831 N93-31287
BRST cohomology ring in 2D gravity coupled to minimal models
[DE93-608192] p 3757 N93-31305
The constraint for the lowest Landau level and the effective field theory approach for the fractional quantum hall system
[DE93-608200] p 3831 N93-31509
The Lipkin model second order phase transition in the deformed su(2) algebra description
[DE93-608201] p 3807 N93-31661
Efficient optical logic, interconnections and processing using quantum confined structures
[AD-A265734] p 3823 N93-31799
Nonclassical disordered phase in the strong quantum limit of frustrated antiferromagnets
[DE92-645691] p 3815 N93-31806
Three lectures on quantum groups: Representations, duality, real forms
[DE93-608159] p 3832 N93-31807
Lie bialgebras with triangular decomposition
[DE93-604232] p 3808 N93-31820
QUANTUM WELLS
Multi-quantum well lateral-field-effect electro-refraction modulator
[AD-A264411] p 3729 N93-31191
Carrier capture in 3-5 semiconductor quantum wells
[ETN-93-94054] p 3828 N93-31620
Coulomb-blockade oscillations in quantum dots and wires
[ETN-93-94055] p 3831 N93-31621
Electronic Landau levels in quantum wells with periodically structured interfaces
[DE93-608514] p 3828 N93-31664
The Optical Stark effect of the exciton due to dynamical coupling between quantized states of the electron and hole in quantum wells
[DE93-608520] p 3819 N93-31665
The conditions leading to intense low frequency generation and strong localization in two level systems
[AD-A265110] p 3819 N93-31791
The optical response of a double quantum well driven by two lasers: Localization and low frequency generation
[AD-A265118] p 3819 N93-31792
Quantum well optical waveguide modulators
[AD-A265421] p 3824 N93-32050
Quantum transport
[AD-A264935] p 3832 N93-32072
QUARK MODELS
Covariant description of the delta in nuclear matter
[KVI-951] p 3817 N93-31149
QUARKS
Pion multiplicity as a probe of the deconfinement transition in heavy-ion collisions
[DE93-608484] p 3817 N93-31059
Radiative electroweak breaking and sparticle spectroscopy with tan(beta) is approximately equal to (m(sub t)) divided by (m(sub b))
[DE93-608399] p 3832 N93-31663
Lepton-quark families, cosmic strings and democratic mass matrix
[DE93-608263] p 3832 N93-31809
Novel spin effects in quantum chromodynamics
[DE93-010955] p 3833 N93-32181
QUARTZ CRYSTALS
Micromachined chemical sensor with integrated microelectronics
[DE93-013761] p 3730 N93-32306
QUASARS
ROSAT observations of quasar 3C 273
[ETN-93-94202] p 3844 N93-31049
QUATERNIONS
Isocliny, Souillart matrices, quaternions and four-dimensional rotations
[REPT-92-57] p 3813 N93-31502
Geometrical aspects of quaternions and complex numbers
[REPT-92-56] p 3807 N93-31612
QUERY LANGUAGES
A query language for spatial data
p 3745 N93-31261
Producing approximate answers to database queries
p 3843 N93-32150
Knowledge based document retrieval in office environments: The Kabiria system
[REPT-92-032] p 3843 N93-32389
QUEUEING THEORY
Managing semantic heterogeneity with production rules and persistent queues
[REPT-92-078] p 3811 N93-31464
Regularity of stochastic processes: A theory based on directional convexity
[REPT-92-70] p 3811 N93-31503
Tapes, queues and communicating automata in DIAC
[REPT-92-94] p 3789 N93-31631

R

RADAR ANTENNAS
An investigation of the channel crosstalk in optical heterodyne controlled phased array radars
[AD-A265412] p 3717 N93-32046
Antenna size, transmitter power, and solid state transmitter considerations in affordable radar design
[AD-A264397] p 3718 N93-32414
RADAR DATA
Deinterleaver technology for future Electronic Support Measures (ESM) systems
[AD-A265005] p 3721 N93-32079
RADAR EQUIPMENT
Installations and methods for measurement of aircraft radio components and systems p 3677 N93-31284
RADAR GEOLOGY
Reconnaissance and deep-drill site selection on Taylor Dome, Antarctica p 3759 N93-31883
RADAR RANGE
Antenna size, transmitter power, and solid state transmitter considerations in affordable radar design
[AD-A264397] p 3718 N93-32414
RADAR TARGETS
Tracking filters for precision Electronic Support Measures (ESM) systems
[AD-A264089] p 3719 N93-31085
RADAR TRACKING
Tracking filters for precision Electronic Support Measures (ESM) systems
[AD-A264089] p 3719 N93-31085
RADAR TRANSMITTERS
Antenna size, transmitter power, and solid state transmitter considerations in affordable radar design
[AD-A264397] p 3718 N93-32414
RADIATION DAMAGE
Mechanisms of microwave induced damage in biologic materials
[AD-A264415] p 3772 N93-32035
RADIATION DETECTORS
Monte-Carlo simulations of secondary electron emission from CsI, induced by 1-10 keV x rays and electrons
[DE93-604906] p 3818 N93-31239
Calibration of a detector system for solar energetic particles analysis p 3860 N93-31721
Applications of optical fiber to remote laser fluorescence analysis
[DE93-607553] p 3732 N93-31826
RADIATION DISTRIBUTION
Radiation from a dipole antenna into an inhomogeneous compressible and nonlinear space-plasma
[ESA-TT-1261] p 3716 N93-31341
Ly-alpha radiation from coronal transients
p 3870 N93-31363
RADIATION DOSAGE
Investigation of laser-induced retinal damage
[AD-A264096] p 3772 N93-31094
Chemical effects of ionizing radiations and electron beam in polymers: Industrial uses
[DE93-609337] p 3708 N93-31179
The Thirteenth AINSE Radiation Biology Conference: Conference handbook
[DE93-609131] p 3773 N93-31225
Radiation exposure in aircraft p 3753 N93-31928
An on-line expert system for diagnosing environmentally induced spacecraft anomalies using CLIPS
p 3794 N93-32142
RADIATION EFFECTS
Mathematical simulation of the induced gamma-radiation in structural materials of spaceships
[DE93-606751] p 3688 N93-31076
Investigation of carbon near the graphite-diamond-liquid triple point
[DE93-609052] p 3708 N93-31178
Chemical effects of ionizing radiations and electron beam in polymers: Industrial uses
[DE93-609337] p 3708 N93-31179
The Thirteenth AINSE Radiation Biology Conference: Conference handbook
[DE93-609131] p 3773 N93-31225
Radiation reaction for the classical relativistic spinning particle in scalar, tensor and linearized gravitational fields
[DE93-608191] p 3757 N93-31304
Electron-microscopic investigations of irradiated and naturally aged aluminum alloy
[DE93-606752] p 3706 N93-31660

Rapid instrumental and separation methods for monitoring radionuclides in food and environmental samples
[DE93-608744] p 3820 N93-31813
Radiation exposure in aircraft p 3753 N93-31928
Mechanisms of microwave induced damage in biologic materials
[AD-A264415] p 3772 N93-32035
Detection of radiation-induced changes in electrochemical properties of austenitic stainless steels using miniaturized specimens and the single-loop electrochemical potentiokinetic reactivation method
[DE93-012865] p 3707 N93-32302

RADIATION MEASUREMENT
SUMER: Temperatures, densities, and velocities in the outer solar atmosphere p 3867 N93-31346
Applications of optical fiber to remote laser fluorescence analysis
[DE93-607553] p 3732 N93-31826
Optically powered photomultiplier tube
[AD-D015735] p 3722 N93-32207

RADIATION MEASURING INSTRUMENTS
Optically powered photomultiplier tube
[AD-D015735] p 3722 N93-32207

RADIATION SOURCES
Characterisation of a protection level Am-241 calibration source
[NPL-RSA(EXT)-35] p 3819 N93-31335

RADIATION TOLERANCE
The Thirteenth AINSE Radiation Biology Conference: Conference handbook
[DE93-609131] p 3773 N93-31225
Radiation exposure in aircraft p 3753 N93-31928

RADIATION TRANSPORT
Experiences with different parallel programming paradigms for Monte Carlo particle transport leads to a portable toolkit for parallel Monte Carlo
[DE93-009061] p 3796 N93-31986

RADIATIVE HEAT TRANSFER
Some historical notes about the Stefan problem
[REPT-93-07] p 3728 N93-32397

RADIATIVE TRANSFER
Radiative modeling of solar prominences, two-dimensional transfer plus partial frequency redistribution p 3875 N93-31389
Radiation/convection coupling in rocket motor and plume analysis
[NASA-CR-193288] p 3698 N93-31845

RADIO ASTRONOMY
Very Large Array (VLA) observations of coronal loops p 3879 N93-31419
User friendly database for Neptune planetary radio astronomy observations
[NASA-CR-193261] p 3851 N93-32324

RADIO CONTROL
Remote driving with reduced bandwidth communication p 3719 N93-32114

RADIO EMISSION
3D reconstruction methods of coronal structures by radio observations p 3874 N93-31387
Analysis of Uranian radio emissions, Uranus Data Analysis Program (UDAP)
[NASA-CR-193524] p 3882 N93-32222

RADIO EQUIPMENT
Installations and methods for measurement of aircraft radio components and systems p 3677 N93-31284

RADIO FREQUENCIES
R and D status report: RF vacuum microelectronics
[AD-A264381] p 3721 N93-32033
Measurements and analysis of the equivalent circuit of the GEC RF Reference Cell
[DE93-013498] p 3718 N93-32425

RADIO FREQUENCY INTERFERENCE
An investigation of methods for improving models of ionospheric plasma-density irregularities and radio-frequency scintillation
[AD-A264156] p 3756 N93-31062

RADIO INTERFEROMETERS
Study of ISM turbulence using radiointerferometers (new method) p 3847 N93-31767

RADIO JETS (ASTRONOMY)
ROSAT observations of quasar 3C 273
[ETN-93-94202] p 3844 N93-31049

RADIO NAVIGATION
On-board derived flight-path measurement as demonstrated by an ILS measurement system p 3677 N93-31282

RADIO OBSERVATION
Radio observations of coronal streamers p 3870 N93-31359
Observations of stationary radio sources: Coronal polar plumes? p 3871 N93-31365
Observation of a coronal streamer at meter and decimeter wavelengths p 3872 N93-31373
Models of coronal streamers at meter-decameter wavelengths p 3872 N93-31374

RADIO PROBING
Theory and application of a Radio-Acoustic Sounding System (RASS)
[PB93-191252] p 3769 N93-31815

RADIO RECEIVERS
Experiences with two GPS receivers in northern Europe
[NLR-TP-91168-U] p 3675 N93-31120
Fix-tracking system
[AD-D015738] p 3718 N93-32210

RADIO SIGNALS
An investigation of methods for improving models of ionospheric plasma-density irregularities and radio-frequency scintillation
[AD-A264156] p 3756 N93-31062
Fix-tracking system
[AD-D015738] p 3718 N93-32210

RADIO SOURCES (ASTRONOMY)
Observations of stationary radio sources: Coronal polar plumes? p 3871 N93-31365

RADIO TRACKING
Fix-tracking system
[AD-D015738] p 3718 N93-32210

RADIO WAVES
An investigation of methods for improving models of ionospheric plasma-density irregularities and radio-frequency scintillation
[AD-A264156] p 3756 N93-31062

RADIOACTIVE AGE DETERMINATION
The diatom record from beneath the West Antarctic Ice Sheet and the global proxy perspective p 3759 N93-31882

RADIOACTIVE CONTAMINANTS
Rapid instrumental and separation methods for monitoring radionuclides in food and environmental samples
[DE93-608744] p 3820 N93-31813

RADIOACTIVE DECAY
HELAS: HELicity amplitude subroutines for Feynman diagram evaluations
[DE93-715538] p 3813 N93-31166
On the quantitative interpretation of uranium series disequilibria
[VTT-TIED-1404] p 3821 N93-31863

RADIOACTIVE ISOTOPES
Rapid instrumental and separation methods for monitoring radionuclides in food and environmental samples
[DE93-608744] p 3820 N93-31813
On the quantitative interpretation of uranium series disequilibria
[VTT-TIED-1404] p 3821 N93-31863

RADIOACTIVE MATERIALS
Micro-organisms, cytotoxins and radioactive preparation: Risks at rescue operations in hospital environment
[FOA-A-40065-4.5] p 3772 N93-32423

RADIOACTIVE WASTES
Effects of low-level radioactive-waste disposal on water chemistry in the unsaturated zone at a site near Sheffield, Illinois, 1982-1984
[PB93-183051] p 3752 N93-31829

RADIOACTIVITY
Annual report of the National Institute of Radiological Sciences
[DE93-704237] p 3820 N93-31810
Integration of measurements with atmospheric dispersion models: Source term estimation for dispersal of (239)Pu due to non-nuclear detonation of high explosive
[DE93-012550] p 3766 N93-32295

RADIOBIOLOGY
The Thirteenth AINSE Radiation Biology Conference: Conference handbook
[DE93-609131] p 3773 N93-31225

RADIOLOGY
Annual report of the National Institute of Radiological Sciences
[DE93-704237] p 3820 N93-31810

RAIL TRANSPORTATION
LNG as a fuel for railroads: Assessment of technology status and economics
[PB93-188787] p 3713 N93-31434
Overview of Fuzzy Logic p 3688 N93-31445
Structure and properties of energetic materials
[AD-A265775] p 3713 N93-31800

RAILGUN ACCELERATORS
A survey of codes for modeling electromagnetic launch
[AD-A264946] p 3667 N93-32074

RAMAN SPECTROSCOPY
Investigation of PACVD protective coating processes using advanced diagnostics techniques
[DE93-013978] p 3711 N93-32307

RANDOM VARIABLES
Efficient estimation of the mean for interval censoring, case 2
[REPT-92-83] p 3811 N93-31491
Estimation of density functionals
[REPT-92-98] p 3807 N93-31655

RANDOM WALK
Tidally averaged models for dispersion in shallow water
[REPT-92-66] p 3769 N93-31497
Random walks and a simple chirally invariant lattice Hamiltonian without fermion doubling
[DE93-609920] p 3821 N93-31913

RANGEFINDING
Expansion-based passive ranging
[NASA-TM-104025] p 3678 N93-32348

RAREFIED GAS DYNAMICS
Heat transfer measurements using infra-red thermography in rarefied flows
[RAE-TM-W-1] p 3724 N93-31336

RATES (PER TIME)
Technique for measuring the spin rate of kinetic energy projectiles
[AD-A264114] p 3717 N93-32031

RATINGS
An intelligent knowledge system for selection of materials for critical aerospace applications (IKSMAT), phase 2
[AD-A263394] p 3835 N93-31078

RATIONS
Trial of emergency ration of the Spanish Air Force p 3778 N93-32247

RATS
Melatonin, the pineal gland, and circadian rhythms
[AD-A264099] p 3772 N93-31061

RAYLEIGH SCATTERING
Rayleigh-Brillouin scattering for high-pressure gas temperature measurements p 3693 N93-31556

RAYLEIGH WAVES
An operator method to study some resonance boundary value problems in elasticity theory
[REPT-92-84] p 3740 N93-31490

REACTING FLOW
Turbulence measurement in a reacting and non-reacting shear layer at a high subsonic Mach number
[NASA-TM-106186] p 3673 N93-31839

REACTION KINETICS
The kinetics of the hydriding of uranium metal 2
[DE93-004766] p 3704 N93-31184
Kinetics of mediated electron transfer between viologen groups in a self-assembled monolayer and metal complexes in solution
[AD-A265729] p 3820 N93-31797
Evaluation of candidate working fluid formulations for the electrothermal-chemical wind tunnel
[NASA-CR-193366] p 3684 N93-31848
The fate of iron on Mars: Mechanism of oxidation of basaltic minerals to ferric-bearing assemblages p 3862 N93-31938
A plotting system for three-dimensional oblique coordinates (triangular mesh) of CITATION
[DE92-526848] p 3792 N93-32185
Optical and kinetic processes in excimer lasers
[AD-A264210] p 3733 N93-32402

REACTIVITY
Phenylethynyl endcapping reagents and reactive diluents
[NASA-CASE-LAR-14796-1] p 3702 N93-31459
Infrared spectroscopy of hydrogen and water on diamond (100)
[AD-A265531] p 3704 N93-31920
Dehydroxylated clay silicates on Mars: Riddles about the Martian regolith solved with ferrian saponites p 3862 N93-31937
Chemical reactivity of the Martian soil p 3867 N93-31963
Improved gallium nitride and aluminum nitride electronic materials
[AD-A264570] p 3710 N93-32010
Relationships between ozone precursor levels and response to emissions reductions: Analysis of regional oxidant model results for the northeastern United States
[PB93-186294] p 3756 N93-32189

REACTOR CORES
A plotting system for three-dimensional oblique coordinates (triangular mesh) of CITATION
[DE92-526848] p 3792 N93-32185

REACTOR MATERIALS
Detection of radiation-induced changes in electrochemical properties of austenitic stainless steels using miniaturized specimens and the single-loop electrochemical potentiokinetic reactivation method
[DE93-012865] p 3707 N93-32302

REAL TIME OPERATION
Timing analysis of real-time systems
[REPT-92-060] p 3803 N93-31251

Two-stage gas measurement system
[NASA-CASE-LAR-14791-1] p 3729 N93-31297
Conception of a modular real-time system for laser remote sensing with particular consideration of upward compatibility
[SER-C-378] p 3731 N93-31340
Real-time trajectory optimization on parallel processors
[NASA-CR-193303] p 3795 N93-31640
Advanced launch system multi-path redundant avionics architecture analysis and characterization
[NASA-CR-4516] p 3795 N93-31642
The application of synthetic-beacon technology to astronomy
[AD-A265146] p 3850 N93-31990
The priority inversion problem and real-time symbolic model checking
[AD-A265408] p 3791 N93-32044
Parametric and combinatorial problems in constrained optimization
[AD-A265595] p 3792 N93-32096
Man-machine cooperation in advanced teleoperation p 3784 N93-32106
Remote driving with reduced bandwidth communication p 3719 N93-32114
Real-time qualitative reasoning for telerobotic systems p 3737 N93-32116
Graphics simulation and training aids for advanced teleoperation p 3793 N93-32119
Implementing a real time reasoning system for robust diagnosis p 3739 N93-32138
Attention focussing and anomaly detection in real-time systems monitoring p 3730 N93-32139
Mixed data/goal driven intelligent real-time assessment and control p 3794 N93-32140
Integration of domain and resource-based reasoning for real-time control in dynamic environments p 3794 N93-32141
DESSY: Making a real-time expert system robust and useful p 3794 N93-32146
PERTS: A Prototyping Environment for Real-Time Systems p 3794 N93-32147
Information for the user in design of intelligent systems p 3801 N93-32149
Is time a real time? An overview of time ontology in informatics
[REPT-92-046] p 3842 N93-32383
Strategic control of reactive behavior in intelligent agents
[AD-A264376] p 3801 N93-32413

RECEIVERS
The microwave radiometer as a remote sensing device: Design and application
[ISBN-9-09-005507-X] p 3746 N93-31537
Development of jitter measurement procedures for digital fiber optic modules
[AD-A265550] p 3824 N93-31915

RECOGNITION
Implementations of the double dot parsing algorithm
[REPT-92-73] p 3788 N93-31506

RECONNAISSANCE
Testing of an experimental system for image reconnaissance p 3677 N93-31283
Reconnaissance and deep-drill site selection on Taylor Dome, Antarctica p 3759 N93-31883

RECURSIVE FUNCTIONS
RLS techniques with generalized forgetting devices for the identification of time-varying systems
[REPT-92-069] p 3810 N93-31463
A single recursion operator is sufficient
[REPT-92-59] p 3805 N93-31500
Adaptive RLS identification with generalized forgetting techniques
[REPT-92-037] p 3810 N93-32390

RED GIANT STARS
Molecules in the envelope of planetary nebulae with the example of CO-envelope of M2-9
[ETN-93-94203] p 3851 N93-31050

RED SHIFT
ROSAT observations of quasar 3C 273
[ETN-93-94202] p 3844 N93-31049

REDUCED GRAVITY
Vibration isolation p 3690 N93-31458
Towards distributed control systems for experiments under micro gravity
[NLR-TP-92027-U] p 3714 N93-32387

REDUNDANCY
Minimize system cost by choosing optimal subsystem reliability and redundancy
[NASA-TM-106251] p 3812 N93-31145
Analysis of fault tolerance in artificial neural networks
[REPT-92-048] p 3797 N93-31255
Advanced launch system multi-path redundant avionics architecture analysis and characterization
[NASA-CR-4516] p 3795 N93-31642

REFERENCE STARS
Calibration of ORFEUS echelle spectrometer
[ETN-93-94201] p 3691 N93-31048

REFLECTANCE
An electrostatic mirror for neutral polar molecules
[DE93-609405] p 3818 N93-31228
Sensor fusion for assured vision in space applications p 3824 N93-32105
Structural characterization of nylon 7 by solid-state NMR, DSC, and ATR-FTIR
[AD-A265800] p 3822 N93-32312
Evaluation of chemical conversion material (protective coating) exposed to space environmental conditions
[NASA-TM-108416] p 3730 N93-32366

REFLECTED WAVES
An efficient model for coupling structural vibrations with acoustic radiation
[NASA-CR-191452] p 3816 N93-31868

REFLEXES
Torsional vestibulo-ocular reflex measurements for identifying otolith asymmetries possibly related to space motion sickness susceptibility
[NASA-CR-193304] p 3774 N93-32364

REFRACTION
Efficient optical logic, interconnections and processing using quantum confined structures
[AD-A265734] p 3823 N93-31799

REFRACTIVITY
Si/SiO2 interface studies by immersion ellipsometry
[AD-A265151] p 3710 N93-31991
An acoustic scattering code
[AD-A265863] p 3816 N93-32316

REFRACTORY MATERIALS
SiC fiber-reinforced Celsian glass-ceramic matrix composite
[NASA-CASE-LEW-15264-1] p 3700 N93-31293
Method of producing a ceramic fiber-reinforced glass-ceramic matrix composite
[NASA-CASE-LEW-15264-2] p 3700 N93-31299

REFRIGERANTS
Chemical and thermal stability of refrigerant-lubricant mixtures with metals
[DE93-013082] p 3715 N93-32163
Materials compatibility and lubricants research on CFC-refrigerant substitutes
[DE93-014770] p 3711 N93-32292
Solubility, viscosity and density of refrigerant/lubricant mixtures
[DE93-014771] p 3711 N93-32293

REFRIGERATING
Materials compatibility and lubricants research on CFC-refrigerant substitutes
[DE93-014770] p 3711 N93-32292

REGGE POLES
Nonlinear Pomeron and Odderon in elastic re-scatterings
[DE93-608326] p 3818 N93-31241

REGOLITH
Dehydroxylated clay silicates on Mars: Riddles about the Martian regolith solved with ferrian saponites p 3862 N93-31937
Low-temperature formation of magnetic iron oxides p 3863 N93-31946
Implications of isotopic compositions of N and Ne in the Martian atmosphere to temporal evolution of its atmosphere and regolith p 3864 N93-31947
Using the Viking biology experimental results to obtain chemical information about Martian regolith p 3865 N93-31955
Chemical modeling constraints on Martian surface mineralogies formed in an early, warm, wet climate, and speculations on the occurrence of phosphate minerals in the Martian regolith p 3865 N93-31956

REGRESSION ANALYSIS
Adaptive RLS identification with generalized forgetting techniques
[REPT-92-037] p 3810 N93-32390

REINFORCING FIBERS
Compressive strengths of fiber-reinforced composites with interface debonding p 3699 N93-31136
SiC fiber-reinforced Celsian glass-ceramic matrix composite
[NASA-CASE-LEW-15264-1] p 3700 N93-31293
Method of producing a ceramic fiber-reinforced glass-ceramic matrix composite
[NASA-CASE-LEW-15264-2] p 3700 N93-31299
Progress in speckle-shift strain measurement p 3693 N93-31558
Damping mechanisms in chemically vapor deposited SiC fibers
[NASA-TM-109236] p 3701 N93-32219
Stress-rupture behavior of small diameter polycrystalline alumina fibers
[NASA-TM-106256] p 3712 N93-32382

RELATIVISTIC EFFECTS
Study of the second-order relativistic light deflection of the Sun using long-baseline fibre-linked interferometers: Laser-Interferometric Solar Relativity (LISOR) test p 3849 N93-31778

RELATIVISTIC PARTICLES
Radiation reaction for the classical relativistic spinning particle in scalar, tensor and linearized gravitational fields
[DE93-608191] p 3757 N93-31304
Scalar symmetry of the massless Dirac equation
[DE93-609921] p 3832 N93-31914
Helicity amplitudes for matter-coupled gravity
[DE93-609932] p 3832 N93-32025

RELATIVISTIC THEORY
Scalar symmetry of the massless Dirac equation
[DE93-609921] p 3832 N93-31914

RELATIVITY
Ashtekar variables, self-dual metrics, and w(infinity)
[DE92-642588] p 3802 N93-31074
2 + 1 gravity without dynamics
[DE92-642587] p 3757 N93-31081
Relativistic transport theory
[KVI-952] p 3830 N93-31121
Non-standard representations of the space-time groups and their applications to the dynamical theory of elementary particles
[DE93-608203] p 3818 N93-31240

RELAXATION (MECHANICS)
Relaxational dynamics and precursor domains in the non-linear shell model
[DE92-642676] p 3820 N93-31805

RELAXATION METHOD (MATHEMATICS)
Mapping robust parallel multigrid algorithms to scalable memory architectures
[NASA-CR-191470] p 3793 N93-32359

RELIABILITY
The position test: A computer generated process for acquisition of inductive logic thinking p 3775 N93-31232
Fire protection for launch facilities using machine vision fire detection p 3687 N93-32113
Information for the user in design of intelligent systems p 3801 N93-32149

RELIABILITY ANALYSIS
Automated failure mode effects and criticality analyses for reliability prediction of multibody mechanical systems p 3738 N93-31107
Minimize system cost by choosing optimal subsystem reliability and redundancy
[NASA-TM-106251] p 3812 N93-31145
Phases of the project development and examination methodologies p 3775 N93-31231
Long-term reliability of gas pipeline repairs by reinforced composites. Annual report, July 1991-June 1992
[PB93-188647] p 3700 N93-31334
Experimental evaluation of an arrival time difference lightning positioning system
[KNMI-WR-92-01] p 3767 N93-31600
Automatic specification of reliability models for fault-tolerant computers
[NASA-TP-3301] p 3812 N93-31869
Multivariate problems of statistics, combinatorics, reliability, and signal processing
[AD-A265213] p 3811 N93-32003
On the design of fault-tolerant robotic manipulator systems p 3737 N93-32125
Enhanced methods for determining operational capabilities and support costs of proposed space systems
[NASA-CR-193265] p 3812 N93-32350

RELIABILITY ENGINEERING
Automated failure mode effects and criticality analyses for reliability prediction of multibody mechanical systems p 3738 N93-31107
System reliability and risk assessment task goals and status p 3695 N93-31568
Life extending control: An interdisciplinary engineering thrust p 3697 N93-31581
Advanced launch system multi-path redundant avionics architecture analysis and characterization
[NASA-CR-4516] p 3795 N93-31642

RELIEF MAPS
Code vector density in topographic mappings
[RSRE-MEMO-4669] p 3746 N93-31611

REMOTE CONTROL
On board image processing for telescience support
[NLR-TP-91213-U] p 3823 N93-31056
Telescience pilot experiment results using telePODI
[NLR-TP-90326-U] p 3823 N93-31118
Remote surface inspection system p 3739 N93-32099
Performance analysis of a robotic system for space-based assembly p 3801 N93-32101
Remote driving with reduced bandwidth communication p 3719 N93-32114

Real-time qualitative reasoning for telerobotic systems p 3737 N93-32116
Potential low-cost telerobotics flight experiments p 3737 N93-32120

REMOTE MANIPULATOR SYSTEM
Active damping in a flexible manipulator p 3689 N93-31452
DESSY: Making a real-time expert system robust and useful p 3794 N93-32146

REMOTE SENSING
Unclassified satellite remote sensing as a component of integrated treaty verification
[DE93-005736] p 3744 N93-31187
Monitoring vegetation greenness with satellite data
[PB93-190882] p 3744 N93-31213
Conception of a modular real-time system for laser remote sensing with particular consideration of upward compatibility
[SER-C-378] p 3731 N93-31340
Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition
[ESA-SP-348] p 3867 N93-31343
SWAN: A study of solar wind anisotropies p 3868 N93-31351
Observational tests of coronal heating models p 3877 N93-31403
Microflares observed with UVSP and HXIS p 3877 N93-31405
The microwave radiometer as a remote sensing device: Design and application
[ISBN-9-09-005507-X] p 3746 N93-31537
A scintillation experiment over a forest
[KNMI-WR-92-04] p 3746 N93-31595
Aerosol optical properties of the free troposphere
[AD-A265795] p 3758 N93-31803
Pulse holographic measurement techniques
[DE93-607634] p 3729 N93-31835
SeaWiFS technical report series. Volume 10: Modeling of the SeaWiFS solar and lunar observations
[NASA-TM-104566-VOL-10] p 3770 N93-31859
Mass balance assessment using GPS p 3761 N93-31892
Navy tactical applications guide, part 2, volume 8: Arctic-East Siberian/Chukchi/Beaufort Seas. Weather analysis and forecast applications
[AD-A265585] p 3768 N93-31922
Determination of the robustness of passive microwave measurements and derivative parameters for use in precipitation discrimination over land
[AD-A265492] p 3768 N93-32008
Polametric passive remote sensing of ocean surface
[AD-A265874] p 3746 N93-32173
The applicability and availability of Former Soviet Union (FSU) space-related capabilities and facilities to energy-related space activities of Department of Energy, Department of Defense and National Aeronautics and Space Administration
[DE93-010286] p 3686 N93-32178
Manipulating remotely-sensed data with Khoros
[DE93-012622] p 3842 N93-32298
Remotely sensed data from space. Distribution, pricing, and applications: An OTA background paper
[PB93-176964] p 3747 N93-32309
The application of remotely sensed data to studies of volcanism within the Galapagos Islands p 3747 N93-32326
Vegetation mapping for environment management and monitoring
[ETN-93-93466] p 3747 N93-32342
Satellite pictures: An efficient aid for information about land use
[ETN-93-93467] p 3747 N93-32343
Remote sensing: A powerful aid for the analysis of problems in the north Holland Vechtstreek
[ETN-93-93468] p 3747 N93-32344
A new view of the sea
[ETN-93-93469] p 3747 N93-32345
SeaWiFS Technical Report Series. Volume 4: An analysis of GAC sampling algorithms: A case study
[NASA-TM-104566-VOL-4] p 3771 N93-32360
ESTAR: The Electronically Scanned Thinned Array Radiometer for remote sensing measurement of soil moisture and ocean salinity
[NASA-TM-4523] p 3747 N93-32362

REMOTE SENSORS
Attention focussing and anomaly detection in real-time systems monitoring p 3730 N93-32139
Non-contact heat flux measurement using a transparent sensor
[NASA-TM-106252] p 3713 N93-32330

REMOTELY PILOTED VEHICLES
Testing of an experimental system for image reconnaissance p 3677 N93-31283
Proximity operations in space station environment p 3689 N93-31449

RENDEZVOUS GUIDANCE
Rendezvous guidance p 3689 N93-31450

REPORTS
UK airmisses involving commercial air transport, September - December 1991
[ETN-93-93930] p 3674 N93-32409

REPRODUCTION
Variability of temperature and salinity in the Middle Atlantic Bight and Gulf of Maine
[PB93-174019] p 3769 N93-31591

REQUIREMENTS
Hitchhiker: Customer Accommodations and Requirements Specifications (CARS)
[NASA-TM-109225] p 3834 N93-31644

RESCUE OPERATIONS
Aircraft accident report: Takeoff stall in icing conditions. USAir Flight 405, Fokker F-28, N485US, LaGuardia Airport, Flushing, New York, 22 March 1992
[PB93-910402] p 3674 N93-32195
Micro-organisms, cytotoxins and radioactive preparation: Risks at rescue operations in hospital environment
[FOA-A-40065-4.5] p 3772 N93-32423

RESEARCH AIRCRAFT
The DLR test aircraft in the FZ-BS, -VFW 614/ATTAS, Dornier DO 228-101, MBB BO105 S-3 p 3675 N93-31272
The basic measurement equipment of the DLR test aircraft p 3675 N93-31273
Instigation and processing of flight tests in DLR p 3675 N93-31275
Pallet for helicopter test instrumentation p 3676 N93-31279

RESEARCH AND DEVELOPMENT
Technology transfer: Potential of BMFT concept for hypersonics
[MBB-LME-202-S-PUB-0505] p 3843 N93-31045
End users: New products and services p 3837 N93-31220
NASA aerospace pyrotechnically actuated systems: Program plan
[NASA-TM-109226] p 3712 N93-31308
Modernization and new technologies: Coping with the information explosion
[NASA-TM-109410] p 3838 N93-31315
DIAC at TWI
[REPT-92-77] p 3787 N93-31472
Publication catalogue of VTT in 1991
[VTT-TIED-1340] p 3838 N93-31535
The Israel Space Agency 1993 p 3883 N93-31590

RESEARCH FACILITIES
Flight test of avionic and air-traffic control systems
[ESA-TT-1279] p 3675 N93-31271
Ground installations for preparation and evaluation of flight tests p 3675 N93-31274
Instigation and processing of flight tests in DLR p 3675 N93-31275
Hypersonic engine component experiments in high heat flux, supersonic flow environment
[NASA-TM-106273] p 3726 N93-31860
Data communication network at the ASRM facility
[NASA-CR-193625] p 3686 N93-32236

RESEARCH MANAGEMENT
The SOHO interdisciplinary science matrix p 3880 N93-31426
Linear algebra for signal processing
[AD-A264677] p 3808 N93-32017

RESEARCH PROJECTS
The Israel Space Agency 1993 p 3883 N93-31590
Targets for Space-Based Interferometry
[ESA-SP-354] p 3844 N93-31750
An annotated bibliography of research involving women, conducted at the US Army Research Institute of Environmental Medicine
[AD-A265497] p 3773 N93-31917
The 1992 Langley Aerospace Research Summer Scholars (LARSS) program
[NASA-CR-193371] p 3833 N93-32229

RESEARCH VEHICLES
Design and implementation of fuzzy logic controllers
[NASA-CR-193268] p 3784 N93-31649

RESERVES
Helium resources of the United States, 1991
[PB93-189652] p 3743 N93-31116

RESIDENTIAL AREAS
Noise from high speed maglev systems: Noise sources, noise criteria, preliminary design guidelines for noise control, and recommendations for acoustical test facility for maglev research
[PB93-154896] p 3736 N93-32193

RESIN MATRIX COMPOSITES
Impact response of laminated plates subjected to transverse loading p 3740 N93-31645

RESISTORS
Affecting factors to the electrical properties of RuO2 thick-film resistors
[DE93-768332] p 3721 N93-32055

RESOLUTION
Generic modal resolution
[REPT-92-90] p 3807 N93-31635

RESONANCE
An operator method to study some resonance boundary value problems in elasticity theory
[REPT-92-84] p 3740 N93-31490
Resonance and near-resonance for a nonlinear wave equation
[REPT-92-92] p 3814 N93-31633
Research studies in electromagnetically induced transparency
[AD-A264303] p 3732 N93-31866
Tides of Massachusetts and Cape Cod Bays
[AD-A264790] p 3770 N93-31983
Active control of flow induced resonance in continuous corrugated tubes
[AD-A265782] p 3727 N93-32310

RESONANT FREQUENCIES
One lateral mode isotropic rotor response to nonsynchronous excitation p 3738 N93-32276

RESOURCE ALLOCATION
Generation and exploration of aggregation abstractions for scheduling and resource allocation p 3835 N93-32128
Protocols for distributive scheduling p 3835 N93-32129
The MICRO-BOSS scheduling system: Current status and future efforts p 3835 N93-32133

RESOURCES MANAGEMENT
Scheduling data transfers in parallel computers and communications systems p 3836 N93-31132
Research in transparent informed prefetching
[AD-A265417] p 3842 N93-32049

RESPONSE TIME (COMPUTERS)
Timing analysis of real-time systems
[REPT-92-060] p 3803 N93-31251

RETARDING
Retardation effects and the origin of filament oscillations p 3853 N93-31679

RETINA
Investigation of laser-induced retinal damage
[AD-A264096] p 3772 N93-31094

REUSABLE ROCKET ENGINES
Overview of the fatigue/fracture/life prediction working group program at the Lewis Research Center p 3696 N93-31574
Constitutive and damage material modeling in a high pressure hydrogen environment p 3696 N93-31577

REVERSE ENGINEERING
Software engineering p 3794 N93-32154

REVOLVING
Navier-Stokes computations for kinetic energy projectiles in steady coning motion: A predictive capability for pitch damping
[AD-A264111] p 3726 N93-32028

REYNOLDS NUMBER
Reynolds number influences in aeronautics
[NASA-TM-107730] p 3673 N93-31732
Effects of an aft facing step on the surface of a laminar flow glider wing
[NASA-CR-193302] p 3673 N93-31855

REYNOLDS STRESS
A critical comparison of several low Reynolds number k-epsilon turbulence models for flow over a backward facing step
[NASA-TM-106173] p 3809 N93-32200

RHODIUM
Availability of platinum and platinum-group metals
[PB93-189496] p 3743 N93-31115

RHYTHM (BIOLOGY)
The effects of an antijet lag diet p 3781 N93-32263

RIBLETS
Study of pipe friction reduction materials for gas transportation.
[PB93-189181] p 3724 N93-31438

RIBONUCLEIC ACIDS
Mechanisms of microwave induced damage in biologic materials
[AD-A264415] p 3772 N93-32035

RICCATI EQUATION
Necessary and sufficient conditions for J-spectral factorizations with a J-lossless property for infinite-dimensional systems in continuous and discrete time
[W-9217] p 3798 N93-31512
Analytic system problems and J-lossless factorization for infinite-dimensional linear systems
[W-9218] p 3798 N93-31513
Robust stabilization of infinite-dimensional systems with respect to coprime factor perturbations
[W-9220] p 3805 N93-31514

H infinity-control with measurement-feedback for Pritchard-Salamon system
[W-9211] p 3799 N93-31628

RICHARDSON NUMBER
Orographically forced internal-wave instability
[ISBN-0-315-73891-X] p 3757 N93-31106

RIDING QUALITY
Interactions between magnetically levitated vehicles and elevated guideway structures
[PB93-148542] p 3736 N93-32192

RIEMANN MANIFOLD
On the scalar curvature of self-dual manifolds
[DE93-608194] p 3804 N93-31306

RING STRUCTURES
BRST cohomology ring in 2D gravity coupled to minimal models
[DE93-608192] p 3757 N93-31305

RISK
Cardiovascular Risk Factors (CVRF) in Spanish pilots with coronary artery disease demonstrated by angiographic studies p 3775 N93-32253
Results and management of pathological lipoprotein concentrations and other cardiovascular risk factors in military pilots of the German Federal Armed Forces p 3775 N93-32254

ROADS
European Road Database: Activities within the ATKIS p 3744 N93-31257
Digital reading of road network data in developing a cartographic information system p 3744 N93-31259
Geographical and topographical data from satellite images used in developing a digital road topology database p 3745 N93-31266
The use of digital road data by a navigation system p 3678 N93-31269

ROBOT ARMS
Characterisation and control of a flexible robot subject to torque ripple
[OUEL-1952/92] p 3734 N93-31156
Sensitivity analysis of coupled bending and torsional vibrations in flexible robot arms
[MEMO-1088] p 3735 N93-31526
Automated assembly of large space structures using an expert system executive p 3690 N93-32102
TeleOperator/telePresence System (TOPS) Concept Verification Model (CVM) development p 3784 N93-32112
On the design of fault-tolerant robotic manipulator systems p 3737 N93-32125
Constrained motion models for insertion/extraction operations applied to the Hermes robot arm: A feasibility study
[NLR-TP-91485-U] p 3736 N93-32204
Ground Robotic Hand Applications for the Space Program study (GRASP)
[NASA-CR-193571] p 3737 N93-32235

ROBOT CONTROL
Evaluation of a solid-state gyroscope for robotics applications
[OUEL-1957/92] p 3728 N93-31125
A theory of planar grasp
[OUEL-1958/92] p 3785 N93-31126
Analysis of the compliant motion achievable with an industrial robot: Identification, feedback and design
[OUEL-1899/91] p 3733 N93-31150
A comparison of force control algorithms for robots in contact with flexible environments
[NASA-CR-193251] p 3789 N93-31638
A vision system planner for increasing the autonomy of the Extravehicular Activity Helper/Retriever
[NASA-CR-193301] p 3777 N93-31844
Supervisory autonomous local-remote control system design: Near-term and far-term applications p 3801 N93-32100

ROBOT DYNAMICS
Analysis of the compliant motion achievable with an industrial robot: Identification, feedback and design
[OUEL-1899/91] p 3733 N93-31150
Characterisation and control of a flexible robot subject to torque ripple
[OUEL-1952/92] p 3734 N93-31156
Constrained motion models for insertion/extraction operations applied to the Hermes robot arm: A feasibility study
[NLR-TP-91485-U] p 3736 N93-32204

ROBOT SENSORS
Evaluation of a solid-state gyroscope for robotics applications
[OUEL-1957/92] p 3728 N93-31125
An iconic programming language for sensor-based robots p 3793 N93-32098
Sensor fusion for assured vision in space applications p 3824 N93-32105
Interactive and cooperative sensing and control for advanced teleoperation p 3784 N93-32108
On the design of fault-tolerant robotic manipulator systems p 3737 N93-32125

ROBOTICS
Evaluation of a solid-state gyroscope for robotics applications
[OUEL-1957/92] p 3728 N93-31125
A theory of planar grasp
[OUEL-1958/92] p 3785 N93-31126
Split rail gripper assembly and tool driver therefor
[NASA-CASE-GSC-13370-1] p 3734 N93-31317
A comparison of force control algorithms for robots in contact with flexible environments
[NASA-CR-193251] p 3789 N93-31638
A vision system planner for increasing the autonomy of the Extravehicular Activity Helper/Retriever
[NASA-CR-193301] p 3777 N93-31844
Striped tape arrays p 3730 N93-31970
The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992)
[NASA-CP-3187-VOL-1] p 3883 N93-32097
An iconic programming language for sensor-based robots p 3793 N93-32098
Stanford Aerospace Research Laboratory research overview p 3690 N93-32103
RATLER: Robotic All-Terrain Lunar Exploration Rover p 3737 N93-32117
JSC flight experiment recommendation in support of Space Station robotic operations p 3691 N93-32121
RACE pulls for shared control p 3686 N93-32122
Automated Assembly Center (AAC) p 3686 N93-32123
An overview of the Kennedy Space Center robotics program p 3691 N93-32124
On the design of fault-tolerant robotic manipulator systems p 3737 N93-32125

ROBOTS
Split rail gripper assembly and tool driver therefor
[NASA-CASE-GSC-13370-1] p 3734 N93-31317
A vision system planner for increasing the autonomy of the Extravehicular Activity Helper/Retriever
[NASA-CR-193301] p 3777 N93-31844
Intelligent security assessment for a mobile robot
[AD-A265003] p 3799 N93-32078
An iconic programming language for sensor-based robots p 3793 N93-32098
Supervisory autonomous local-remote control system design: Near-term and far-term applications p 3801 N93-32100
Stanford Aerospace Research Laboratory research overview p 3690 N93-32103
Integration of advanced teleoperation technologies for control of space robots p 3784 N93-32107
Satellite Test Assistant Robot (STAR) p 3690 N93-32111
TeleOperator/telePresence System (TOPS) Concept Verification Model (CVM) development p 3784 N93-32112
Potential roles for EVA and telerobotics in a unified worksite p 3690 N93-32118
JSC flight experiment recommendation in support of Space Station robotic operations p 3691 N93-32121
Automated Assembly Center (AAC) p 3686 N93-32123
An overview of the Kennedy Space Center robotics program p 3691 N93-32124
Robust stability of second-order systems
[NASA-CR-193624] p 3809 N93-32373

ROBUSTNESS (MATHEMATICS)
Robust stabilization of infinite-dimensional systems with respect to coprime factor perturbations
[W-9220] p 3805 N93-31514
Determination of the robustness of passive microwave measurements and derivative parameters for use in precipitation discrimination over land
[AD-A265492] p 3768 N93-32008
Set-membership identification for robust control design
[AD-A265669] p 3800 N93-32197

ROCK MECHANICS
Acoustic logging for structural and hydrogeological bedrock investigations
[VTT-JULK-762] p 3816 N93-31865

ROCKET ENGINES
Rocketdyne PSAM: In-house enhancement/application p 3694 N93-31566
The PIT MkV pulsed inductive thruster
[NASA-CR-191155] p 3698 N93-32353

ROCKET EXHAUST
An experimental study of under-expanded jets
[OUEL-1959/92] p 3722 N93-31124
Application of the SAHA equation to high temperature (greater than or equal to 6000 K) rocket exhaust
[AD-A264004] p 3692 N93-31291
OPAD 1991 p 3693 N93-31559
Four dimensional reconstruction and analysis of plume images p 3694 N93-31561
Radiation/convection coupling in rocket motor and plume analysis
[NASA-CR-193288] p 3698 N93-31845

ROCKET PROPELLANTS
Application of the SAHA equation to high temperature (greater than or equal to 6000 K) rocket exhaust
[AD-A264004] p 3692 N93-31291
The PIT MkV pulsed inductive thruster
[NASA-CR-191155] p 3698 N93-32353

ROCKET-BORNE INSTRUMENTS
Underneath coronal loops: MSDP observations coordinated with SERTS 4 and NIXT flights p 3876 N93-31397

ROCKS
Composition of weakly altered Martian crust: Clues from imaging spectroscopy p 3865 N93-31952
Japan's Sunshine Project
[DE93-768268] p 3749 N93-32054

ROLLING CONTACT LOADS
The development of a ring model for the study of tire in-plane dynamics
[MEMT-20] p 3734 N93-31508

ROLLING MOMENTS
Experiments in the control of wing rock at high angle of attack using tangential leading edge blowing p 3683 N93-31068

ROOTS OF EQUATIONS
The nth roots with Hilbert-Schmidt defect operator of normal contractions
[DE93-608163] p 3803 N93-31288

ROSAT MISSION
ROSAT observations of quasar 3C 273
[ETN-93-94202] p 3844 N93-31049

ROSS ICE SHELF
The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop
[NASA-CP-3222] p 3758 N93-31878
Reconstruction of late Wisconsinan Ice Sheet and sea-level implications p 3758 N93-31879
Lithology and chronology of ice-sheet fluctuations (magnetic susceptibility of cores from the western Ross Sea) p 3759 N93-31880
Reconnaissance and deep-drill site selection on Taylor Dome, Antarctica p 3759 N93-31883
Condition of the Ross Ice Shelf derived from AVHRR imagery p 3760 N93-31886
Changes on the ice plain of Ice Stream B and Ross Ice Shelf p 3760 N93-31889
Sensible and latent heat flux estimates in Antarctica p 3763 N93-31902
Surface winds over West Antarctica p 3763 N93-31903

ROTARY STABILITY
Design and application of Active Magnetic Bearings (AMB) for vibration control p 3738 N93-32279

ROTATING ENVIRONMENTS
Rotational speed control p 3689 N93-31457

ROTATING PLASMAS
Model of a rotating magnetic cloud p 3857 N93-31707

ROTATING SHAFTS
Perturbation technique for identification of the lowest modes of rotors with fluid interaction p 3738 N93-32277
Vibrational diagnostics of rotating machinery malfunctions p 3738 N93-32278
Design and application of Active Magnetic Bearings (AMB) for vibration control p 3738 N93-32279

ROTATION
Turntable mechanism
[NASA-CASE-MFS-28522-1] p 3734 N93-31313
Differential small displacements and rotation extensions in three dimensional coordinate systems
[SER-B-295] p 3804 N93-31338

ROTOR AERODYNAMICS
Localization of aeroelastic modes in mistuned high-energy turbines p 3697 N93-31586

ROTOR BLADES (TURBOMACHINERY)
High cycle fatigue of glass fibre reinforced epoxy materials for wind turbines
[DLR-FB-92-17] p 3700 N93-31461
Vibration and Rotor Dynamics
[VKI-LS-1992-06] p 3741 N93-32270
Basic structural dynamics p 3741 N93-32271
Structural dynamic characteristics of individual blades p 3683 N93-32272
Structural dynamic characteristics of bladed assemblies p 3683 N93-32273
Vibration analysis in turbomachines p 3683 N93-32274
Transmission of sound through a rotor
[NLR-TP-92014-U] p 3683 N93-32386

ROTOR BODY INTERACTIONS
Perturbation technique for identification of the lowest modes of rotors with fluid interaction p 3738 N93-32277

ROTOR DYNAMICS
The influence of variable flow velocity on unsteady airfoil behavior
[DLR-FB-92-22] p 3672 N93-31320
Vibration and Rotor Dynamics
[VKI-LS-1992-06] p 3741 N93-32270
Structural dynamic characteristics of individual blades p 3683 N93-32272
Structural dynamic charactertistics of bladed assemblies p 3683 N93-32273
Vibration analysis in turbomachines p 3683 N93-32274
Excitation by flows in seals and clearances. Part 1: Introduction: Fluid-structure-interactions in rotordynamics. Part 2: Identification of rotordynamic coefficients of annular seals p 3738 N93-32275
One lateral mode isotropic rotor response to nonsynchronous excitation p 3738 N93-32276
Perturbation technique for identification of the lowest modes of rotors with fluid interaction p 3738 N93-32277
Vibrational diagnostics of rotating machinery malfunctions p 3738 N93-32278
ROTOR LIFT
Definition of an airfoil family for the EUROFAR rotor
[DLR-FB-92-04] p 3679 N93-31197
ROTORCRAFT AIRCRAFT
Design and implementation of fuzzy logic controllers
[NASA-CR-193268] p 3784 N93-31649
ROTORS
Penn State axial flow turbine facility: Performance and nozzle flow field p 3698 N93-31588
Initial results from the NASA-Lewis wave rotor experiment
[NASA-TM-106148] p 3683 N93-32368
ROUTES
Maglev guideway route alignment and right-of-way requirements
[PB93-154854] p 3735 N93-31592
A preliminary empirical evaluation of virtual reality as an instructional medium for visual-spatial tasks p 3784 N93-32151
ROVING VEHICLES
Planetary rover developments at JPL p 3737 N93-32115
RP-1 ROCKET PROPELLANTS
Lubrication of an 85-mm ball bearing with RP-1
[NASA-TM-106254] p 3686 N93-31670
Radiation/convection coupling in rocket motor and plume analysis
[NASA-CR-193288] p 3698 N93-31845
RUBIDIUM
Local order and concentration fluctuations in K-Pb and Rb-Pb alloys
[DE93-606725] p 3704 N93-31093
RUBIDIUM ISOTOPES
Isotopically selective detection of rubidium in krypton
[ETN-93-94051] p 3703 N93-31630
RULES
Deriving incremental production rules for deductive data
[REPT-92-081] p 3787 N93-31466
RUN TIME (COMPUTERS)
Processor-management in distributed systems with a compute-intensive workload
[REPT-92-52] p 3787 N93-31486
Primal-dual algorithms for linear programming based on the logarithmic barrier method
[REPT-92-104] p 3790 N93-31659
RUNGE-KUTTA METHOD
Roe's scheme and the MUSCL technique for the Navier-Stokes equations
[MEMO-1090] p 3725 N93-31527
Explicit, high-order Runge-Kutta-Nystroem methods for parallel computers
[CWI-NM-R9219] p 3796 N93-32395
Parallel block predictor-corrector methods of Runge-Kutta type
[CWI-NM-R9220] p 3797 N93-32396
RUNWAYS
Land subsidence and problems affecting land use at Edwards Air Force Base and vicinity, California, 1990
[PB93-182236] p 3765 N93-32191

S

S WAVES
Acoustic logging for structural and hydrogeological bedrock investigations
[VTT-JULK-762] p 3816 N93-31865
SAAB AIRCRAFT
Modal measurements and propeller field excitation on acoustic full scale mockup of SAAB 340 aircraft
[FFA-TN-1992-08] p 3815 N93-31051
SAFETY
Environment and safety research
[PB93-188860] p 3751 N93-31142
Applying MORT maintenance safety analysis in Finnish industry
[VTT-TIED-1332] p 3714 N93-31545
Maglev guideway and route integrity requirements
[PB93-154870] p 3736 N93-32086
A PC-based simulation of the National Transonic Facility's safety microprocessor
[NASA-TM-109003] p 3796 N93-32224
SAFETY MANAGEMENT
Near miss reporting in the chemical process industry
[ISBN-9-03-860181-6] p 3714 N93-31539
Applying MORT maintenance safety analysis in Finnish industry
[VTT-TIED-1332] p 3714 N93-31545
SAHA EQUATIONS
Application of the SAHA equation to high temperature (greater than or equal to 6000 K) rocket exhaust
[AD-A264004] p 3692 N93-31291
SALINITY
Variability of temperature and salinity in the Middle Atlantic Bight and Gulf of Maine
[PB93-174019] p 3769 N93-31591
ESTAR: The Electronically Scanned Thinned Array Radiometer for remote sensing measurement of soil moisture and ocean salinity
[NASA-TM-4523] p 3747 N93-32362
SALT SPRAY TESTS
Accelerated and real-time corrosion testing of aluminum-lithium alloys
[NLR-TP-91203-U] p 3707 N93-32385
SAMPLED DATA SYSTEMS
Sampled-data and discrete-time H2 optimal control
[W-9222] p 3798 N93-31525
Determination of design and operation parameters for upper atmospheric research instrumentation to yield optimum resolution with deconvolution, appendix 3
[NASA-CR-192835] p 3766 N93-32231
SAMPLING
Two-stage gas measurement system
[NASA-CASE-LAR-14791-1] p 3729 N93-31297
SANDS
Shaly sand formation evaluation in tight gas sands using electrochemical potential measurements
[PB93-163186] p 3764 N93-32087
SANDWICH STRUCTURES
Performance of an impact loaded sandwich plate
[VTT-JULK-767] p 3702 N93-32388
SATELLITE ALTIMETRY
Changes on the ice plain of Ice Stream B and Ross Ice Shelf p 3760 N93-31889
SATELLITE COMMUNICATION
Space qualification for an intersatellite laser communications system
[AD-A265145] p 3717 N93-31989
SATELLITE CONTROL
Petite amateur naval satellite spacecraft digital control system: A hardware design
[AD-A265234] p 3690 N93-32061
SATELLITE DOPPLER POSITIONING
Digital processing for positioning with one satellite
[ETN-93-93732] p 3685 N93-31318
SATELLITE GROUND TRACKS
Orbit Analysis Tools Software user's manual, version 1
[AD-A265012] p 3686 N93-32081
SATELLITE IMAGERY
Monitoring vegetation greenness with satellite data
[PB93-190882] p 3744 N93-31213
Geographical and topographical data from satellite images used in developing a digital road topology database p 3745 N93-31266
Velocities of Thwaites and Land glaciers p 3760 N93-31885
Condition of the Ross Ice Shelf derived from AVHRR imagery p 3760 N93-31886
SPOT satellite mapping of Ice Stream B p 3760 N93-31887
Surface velocity fields of Ice Streams D and E derived from repeat satellite imagery p 3760 N93-31890
Radar studies of the West Antarctic ice streams p 3760 N93-31891
Recent acceleration of Thwaites Glacier p 3761 N93-31893
Surface winds over West Antarctica p 3763 N93-31903
Determination of the robustness of passive microwave measurements and derivative parameters for use in precipitation discrimination over land
[AD-A265492] p 3768 N93-32008
Manipulating remotely-sensed data with Khoros
[DE93-012622] p 3842 N93-32298
Remotely sensed data from space. Distribution, pricing, and applications: An OTA background paper
[PB93-176964] p 3747 N93-32309
The application of remotely sensed data to studies of volcanism within the Galapagos Islands p 3747 N93-32326
Satellite pictures: An efficient aid for information about land use
[ETN-93-93467] p 3747 N93-32343
SATELLITE NAVIGATION SYSTEMS
Aerial cartography using SICAD NAV-AIR p 3744 N93-31258
SATELLITE OBSERVATION
Unclassified satellite remote sensing as a component of integrated treaty verification
[DE93-005736] p 3744 N93-31187
Sungrazing comet observations associated with SOHO p 3871 N93-31369
Reconnection in the solar corona p 3855 N93-31695
Observation of particle bursts in the tail of planet Mars onboard the Phobos 2 spacecraft p 3856 N93-31699
Mass, momentum and energy transport from the Sun to the Earth by different types of the solar wind: Prognoz 7 observations p 3857 N93-31705
Solar wind penetration to geostationary altitude during the March 1991 magnetic storm p 3857 N93-31706
Role of the INTERBALL small scale investigations in the GGS program p 3859 N93-31717
Determination of the robustness of passive microwave measurements and derivative parameters for use in precipitation discrimination over land
[AD-A265492] p 3768 N93-32008
Diagnostics of magnetic substorms using satellite observations of magnetic pulsations
[AD-A264300] p 3764 N93-32084
Satellite pictures: An efficient aid for information about land use
[ETN-93-93467] p 3747 N93-32343
SATELLITE ORBITS
Orbit Analysis Tools Software user's manual, version 1
[AD-A265012] p 3686 N93-32081
Satellite motion around an oblate planet: A perturbation solution for all orbital parameters
[AD-A265779] p 3690 N93-32335
SATELLITE TRACKING
The application of phase tracking GPS for flight test trajectory determination
[NLR-TP-91349-U] p 3678 N93-32337
SATELLITE-BORNE INSTRUMENTS
AOTF enhancements for a space-based spectropolarimeter
[NASA-CR-193290] p 3691 N93-31040
Calibration of ORFEUS echelle spectrometer
[ETN-93-94201] p 3691 N93-31048
The solar oscillations investigation: Michelson Doppler imager p 3867 N93-31345
SUMER: Temperatures, densities, and velocities in the outer solar atmosphere p 3867 N93-31346
The Large Angle Spectroscopic Coronagraph (LASCO): Visible light coronal imaging and spectroscopy p 3868 N93-31350
SWAN: A study of solar wind anisotropies p 3868 N93-31351
The Charge, Element, and Isotope Analysis System CELIAS on SOHO p 3869 N93-31352
COSTEP: Comprehensive suprathermal and energetic particle analyser for SOHO: Scientific goals and data description p 3869 N93-31353
Energetic particle analyser ERNE p 3869 N93-31354
Sungrazing comet observations associated with SOHO p 3871 N93-31369
Bayesian analysis of SOHO spectra p 3876 N93-31398
Objectives of RESIK solar concave soft x ray spectrometer for Coronas-F mission p 3879 N93-31418
SCALING LAWS
Spectra and structure functions of temperature fluctuations in the inner solar wind p 3860 N93-31720
SCANDINAVIA
Experiences with two GPS receivers in northern Europe
[NLR-TP-91168-U] p 3675 N93-31120
SCANDIUM COMPOUNDS
Hierarchical textures in ferroelectric crystals
[DE93-608938] p 3827 N93-31175
SCANNERS
Goddard Conference on Mass Storage Systems and Technologies, volume 2
[NASA-CP-3198-VOL-2] p 3839 N93-31964
The redwood project: An overview p 3841 N93-31979
Upgrade of the LIMDAS day/night whole sky imager
[AD-A265871] p 3769 N93-32171

SCANNING
Performance of scanline-oriented CSG direct display algorithms
[REPT-93-03] p 3788 N93-31548
SCANNING ELECTRON MICROSCOPY
Material characterization and fractographic examination of Ti-17 fatigue crack growth specimens for SMP SC33
p 3681 N93-31744
SCATTERING
Some outstanding issues in pion scattering at energies above the (delta) resonance
[DE93-012747] p 3822 N93-32300
SCATTERING AMPLITUDE
Nonlinear Pomeron and Odderon in elastic re-scatterings
[DE93-608326] p 3818 N93-31241
Supercritical pomeron and spin effects in meson-nucleon scattering at high energy
[DE93-608327] p 3818 N93-31242
Odderon dominance in dipole model of hadron elastic scattering
[DE93-608329] p 3819 N93-31243
SCATTERING CROSS SECTIONS
Molecular dynamical and structural studies for the bakelite by neutron cross section measurements
[DE93-609444] p 3819 N93-31244
SCATTERING FUNCTIONS
Mathematical inversion of multiple-scattering of laser light
[DE93-609128] p 3803 N93-31224
SCENE ANALYSIS
Auditory spectro-temporal pattern analysis
[AD-A264691] p 3773 N93-31981
SCHEDULES
Protocols for distributive scheduling
p 3835 N93-32129
SCHEDULING
Scheduling data transfers in parallel computers and communications systems p 3836 N93-31132
Job shop scheduling by local search
[MEMO-COSOR-92-29] p 3834 N93-31510
Periodic multiprocessor scheduling
[ETN-93-94043] p 3795 N93-31522
Decay-usage scheduling in multiprocessor and distributed systems. 1: Theory
[REPT-92-105] p 3795 N93-31864
New architectures to reduce I/O bottlenecks in high-performance systems
[DE93-009059] p 3795 N93-31985
Generation and exploration of aggregation abstractions for scheduling and resource allocation
p 3835 N93-32128
Protocols for distributive scheduling
p 3835 N93-32129
Scheduling with partial orders and a causal model
p 3835 N93-32130
Crisis action planning and replanning using SIPE-2
p 3835 N93-32131
The MICRO-BOSS scheduling system: Current status and future efforts p 3835 N93-32133
Decision-theoretic control of EUVE telescope scheduling p 3835 N93-32134
Decision theory for computing variable and value ordering decisions for scheduling problems
p 3835 N93-32137
Integration of domain and resource-based reasoning for real-time control in dynamic environments
p 3794 N93-32141
Performance analysis of a large-grain dataflow scheduling paradigm
[NASA-TP-3323] p 3796 N93-32213
Ant system for job-shop scheduling
[REPT-92-066] p 3792 N93-32346
SCINTILLATION
An investigation of methods for improving models of ionospheric plasma-density irregularities and radio-frequency scintillation
[AD-A264156] p 3756 N93-31062
A scintillation experiment over a forest
[KNMI-WR-92-04] p 3746 N93-31595
Detecting and tracking changes in solar wind conditions using interplanetary scintillation p 3857 N93-31703
SCINTILLATION COUNTERS
The ZEUS uranium calorimeter: Main characteristics and first operating experience
[NIKHEF-H/92-15] p 3728 N93-31117
A scintillation experiment over a forest
[KNMI-WR-92-04] p 3746 N93-31595
SCORING
NIST scoring package certification procedures in conjunction with NIST special databases 2 and 6
[PB93-188126] p 3838 N93-31331
SCRUBBERS
Biological treatment of porous off-gases
[VTT-JULK-766] p 3752 N93-31853
SEA ICE
Modeling studies of ice-ocean dynamics and thermodynamics
[AD-A264084] p 3769 N93-31082
Some historical notes about the Stefan problem
[REPT-93-07] p 3728 N93-32397
SEA LEVEL
Reconstruction of late Wisconsinan Ice Sheet and sea-level implications p 3758 N93-31879
The diatom record from beneath the West Antarctic Ice Sheet and the global proxy perspective
p 3759 N93-31882
Changes on the ice plain of Ice Stream B and Ross Ice Shelf p 3760 N93-31889
Tides of Massachusetts and Cape Cod Bays
[AD-A264790] p 3770 N93-31983
SEA WATER
Total CO2 and nitrate measurements in the southwest pacific during austral autumn, 1990
[PB93-188415] p 3769 N93-31333
SEARCH RADAR
Antenna size, transmitter power, and solid state transmitter considerations in affordable radar design
[AD-A264397] p 3718 N93-32414
SEARCHING
Job shop scheduling by local search
[MEMO-COSOR-92-29] p 3834 N93-31510
SEASONS
Mean seasonal cycles and interannual variations at 0 deg, 165 deg E during 1986-1992
[PB93-186195] p 3768 N93-31874
SECONDARY EMISSION
Monte-Carlo simulations of secondary electron emission from CsI, induced by 1-10 keV x rays and electrons
[DE93-604906] p 3818 N93-31239
SECURITY
TSCA confidential business information security manual
[PB93-184844] p 3839 N93-31833
Advances in Analysis and Detection of Explosives. Proceedings of the 4th International Symposium on Analysis and Detection of Explosives
[AD-A265002] p 3713 N93-32077
Intelligent security assessment for a mobile robot
[AD-A265003] p 3799 N93-32078
SEDIMENTS
Geologic controls on the West Antarctic Ice Sheet
p 3762 N93-31900
SEEING (ASTRONOMY)
The application of synthetic-beacon technology to astronomy
[AD-A265146] p 3850 N93-31990
SEISMIC WAVES
The shot continuation operator
[REPT-92-065] p 3758 N93-31606
SEISMOLOGY
Proceedings of the First Geological Materials Constitutive Modeling Workshop
[DE93-009161] p 3765 N93-32176
A neural network approach to seismic phase identification
[DE93-013601] p 3800 N93-32305
SELF ALIGNMENT
A self-aligning interferometer suitable for white or monochromatic light consisting solely of a mirror and a reflection grating, part 2
[DE93-609517] p 3823 N93-31246
SELF DIFFUSION (SOLID STATE)
Diffusion coefficients in molten slags
[NPL-DMM(A)-82] p 3703 N93-31603
SELF EXCITATION
Enhanced mixing of a rectangular supersonic jet by natural and induced screech
[NASA-TM-106245] p 3672 N93-31672
SELF ORGANIZING SYSTEMS
Neural nets and their relevance for information retrieval
[CL-91-02] p 3798 N93-31469
Kohonen feature maps in natural language processing
[CL-91-01] p 3788 N93-31517
Connectionist models and linguistic theory: Investigations of stress systems in language
[AD-A265450] p 3777 N93-32064
SELF OSCILLATION
Chaotic dynamics of high density photon and exciton system
[DE93-608522] p 3819 N93-31666
Excitonic bistabilities, instabilities and chaos in laser-pumped semiconductor
[DE93-608677] p 3731 N93-31669
SEMANTICS
On the integration of algebraic and logic languages
[ETN-93-94238] p 3786 N93-31205
Reasoning about termination of PROLOG programs
[CT-91-12] p 3787 N93-31479
Object oriented application flow graphs and their semantics
[CT-92-01] p 3788 N93-31528
Revision by expansion in logic programs
[REPT-93-02] p 3790 N93-31852
Producing approximate answers to database queries
p 3843 N93-32150
SEMICONDUCTOR DEVICES
Scattering of electrons at heterostructure interfaces
[ETN-93-94044] p 3828 N93-31523
Characteristics and properties of the continuity equations in a semiconductor
[REPT-92-080] p 3720 N93-31609
Light-induced band-structure modifications in modulation-doped 3-5 semiconductor heterostructures
[ETN-93-94053] p 3828 N93-31619
Excitonic bistabilities, instabilities and chaos in laser-pumped semiconductor
[DE93-608677] p 3731 N93-31669
Noise attenuating circuit for mechanical relay including optical isolation
[AD-D015700] p 3720 N93-31842
SEMICONDUCTOR JUNCTIONS
Quantum transport
[AD-A264935] p 3832 N93-32072
SEMICONDUCTOR LASERS
Mode hopping in semiconductor lasers
p 3731 N93-31131
Optoelectronic Materials Center: A collaborative program including University of New Mexico, Stanford University and California Institute of Technology
[AD-A265575] p 3732 N93-32052
SEMICONDUCTORS (MATERIALS)
The Optical Stark effect of the exciton due to dynamical coupling between quantized states of the electron and hole in quantum wells
[DE93-608520] p 3819 N93-31665
Chaotic dynamics of high density photon and exciton system
[DE93-608522] p 3819 N93-31666
An electron cyclotron resonance plasma process for InP passivation
[AD-A265036] p 3826 N93-31998
Large-area, triple-junction a-Si alloy production scale-up
[DE93-010007] p 3750 N93-32177
Method and apparatus for characterizing the quality for electrically thin semiconductor films
[AD-D015734] p 3830 N93-32206
SENSORS
Thin film heat flux sensor for Space Shuttle Main Engine turbine environment p 3693 N93-31554
SENSORY FEEDBACK
Integration of advanced teleoperation technologies for control of space robots p 3784 N93-32107
Air Force research in human sensory feedback for telepresence p 3801 N93-32109
SEPARATED FLOW
A critical comparison of several low Reynolds number k-epsilon turbulence models for flow over a backward facing step
[NASA-TM-106173] p 3809 N93-32200
SEQUENTIAL CONTROL
An efficient constrained predictive control algorithm for 2-input systems
[OUEL-1946/92] p 3785 N93-31152
SERIES EXPANSION
Plaquette expansion in lattice Hamiltonian models
[DE93-609846] p 3813 N93-31906
SERUMS
Lipidemic profile of Hellenic Airforce officers
p 3774 N93-32250
Correlation of life-style and dietary concomitants of Greek pilots with serum analytes p 3780 N93-32256
SERVICE LIFE
A method to predict the orbital lifetimes of free tethers and tether-trailing satellites using artificial neural networks p 3687 N93-31069
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-10064] p 3692 N93-31552
System reliability and risk assessment task goals and status p 3695 N93-31568
System engineering concept demonstration, system engineering needs, volume 2
[AD-A265468] p 3791 N93-32023
Damage severity of monitored fatigue load spectra
[NLR-TP-92009-U] p 3679 N93-32205
SERVOCONTROL
A comparison of force control algorithms for robots in contact with flexible environments
[NASA-CR-193251] p 3789 N93-31638
SERVOMECHANISMS
Pulse-modulated control of switching valves for an electro-hydraulic servo actuator
[DLR-FB-92-18] p 3719 N93-31462

An iconic programming language for sensor-based robots p 3793 N93-32098

SET THEORY

Introduction to Fuzzy Set Theory p 3689 N93-31446

The crease structure of the Karush-Kuhn-Tucker set in parametric optimization [REPT-92-62] p 3806 N93-31551

Estimating the spatial extent of attractors of iterated function systems [AD-A265856] p 3809 N93-32315

SEX FACTOR

An annotated bibliography of research involving women, conducted at the US Army Research Institute of Environmental Medicine [AD-A265497] p 3773 N93-31917

SHAPES

Estimating the spatial extent of attractors of iterated function systems [AD-A265856] p 3809 N93-32315

SHEAR FLOW

GARTEUR 3D sheer layer experiment [FFA-TN-1992-26] p 3671 N93-31052

SPOT satellite mapping of Ice Stream B p 3760 N93-31887

Structure and stability of reacting compressible free shear layers [AD-A265594] p 3727 N93-32095

Time accurate simulations of compressible shear flows [NASA-CR-193410] p 3728 N93-32371

SHEAR LAYERS

GARTEUR 3D sheer layer experiment [FFA-TN-1992-26] p 3671 N93-31052

Enhanced mixing of a rectangular supersonic jet by natural and induced screech [NASA-TM-106245] p 3672 N93-31672

Reynolds number influences in aeronautics [NASA-TM-107730] p 3673 N93-31732

Turbulence measurement in a reacting and non-reacting shear layer at a high subsonic Mach number [NASA-TM-106186] p 3673 N93-31839

Calculations on unsteady type 4 interaction at Mach 8 [AD-A265214] p 3673 N93-32004

Structure and stability of reacting compressible free shear layers [AD-A265594] p 3727 N93-32095

SHEAR PROPERTIES

A mechanics model for the compressive response of fiber reinforced composites [AD-A265556] p 3701 N93-32067

Structure and stability of reacting compressible free shear layers [AD-A265594] p 3727 N93-32095

SHEAR STRENGTH

Compressive strengths of fiber-reinforced composites with interface debonding p 3699 N93-31136

The role of the margins in ice stream dynamics p 3761 N93-31896

SHEAR STRESS

Design of multiple-ply laminated composite tapered beams [NASA-TM-108411] p 3700 N93-31650

In search of ice-stream sticky spots p 3762 N93-31899

A critical comparison of several low Reynolds number k-epsilon turbulence models for flow over a backward facing step [NASA-TM-106173] p 3809 N93-32200

The development of a tungsten heavy alloy that fails by an adiabatic shear mechanism, phase 1 [AD-A265867] p 3707 N93-32318

SHOCK FRONTS

Coronal shock waves p 3853 N93-31681

Quasi-parallel shock re-formation: Two-dimensional simulations p 3826 N93-31682

Ion acceleration at parallel shocks: Self-consistent plasma simulations p 3826 N93-31683

SHOCK RESISTANCE

On the feasibility of a transient dynamic design analysis [AD-A264882] p 3733 N93-31101

Longitudinal acceleration test of overhead luggage bins in a transport airframe section [DOT/FAA/CT-92/9] p 3674 N93-31652

SHOCK SPECTRA

On the feasibility of a transient dynamic design analysis [AD-A264882] p 3733 N93-31101

SHOCK TUNNELS

Numerical simulation of the flow in a 1:57-scale axisymmetric model of a large blast simulator [AD-A265551] p 3685 N93-31916

SHOCK WAVE INTERACTION

Parametric studies of shock wave/boundary layer interactions over 2D compression corners at Mach 6 [VKI-TN-181] p 3672 N93-31538

Heliospheric current sheet effects on the propagation of solar-generated shock waves p 3854 N93-31685

Calculations on unsteady type 4 interaction at Mach 8 [AD-A265214] p 3673 N93-32004

SHOCK WAVES

An experimental study of under-expanded jets [OUEL-1959/92] p 3722 N93-31124

Preliminary observations of solar type 2 bursts with the new radiospectrograph in Tremsdorf (Germany) p 3872 N93-31370

A numerical model of interaction of coronal transients with the solar wind p 3874 N93-31385

Coronal shock waves p 3853 N93-31681

Quasi-parallel shock re-formation: Two-dimensional simulations p 3826 N93-31682

Ion acceleration at parallel shocks: Self-consistent plasma simulations p 3826 N93-31683

Plasma wave phenomena observed at interplanetary shocks by the Ulysses URAP experiment p 3826 N93-31684

Heliospheric current sheet effects on the propagation of solar-generated shock waves p 3854 N93-31685

Influence of interplanetary shocks on approximately 10 MeV protons: A phenomenological classification p 3854 N93-31686

A new method for measuring the speed of the bow shock p 3854 N93-31687

On Short Large Amplitude Magnetic Structures in the vicinity of the quasi-parallel region of the Earth's bow shock p 3854 N93-31688

Energetics of ULF/ELF plasma waves in the solar wind and outer Earth's magnetosphere p 3826 N93-31689

ULF/ELF electromagnetic waves associated with the quasiperpendicular Earth's bow shock crossings p 3827 N93-31690

Calculations on unsteady type 4 interaction at Mach 8 [AD-A265214] p 3673 N93-32004

SHRINKAGE

An investigation of squeeze-cast alloy 718 [NASA-TM-108412] p 3706 N93-31646

SIDEBANDS

An investigation of the channel crosstalk in optical heterodyne controlled phased array radars [AD-A265412] p 3717 N93-32046

SIGNAL ANALYSIS

Pulse discriminator for crosstalk rejection in a multi-channel isochromat photoemission spectroscopy [REPT-92-062] p 3719 N93-31253

SIGNAL DETECTION

Auditory spectro-temporal pattern analysis [AD-A264691] p 3773 N93-31981

Trellis coded modulation applied to orthogonal signals [AD-A265232] p 3717 N93-32060

Fix-tracking system [AD-D015738] p 3718 N93-32210

SIGNAL PROCESSING

Towards a new approach to autonomous navigation for a vehicle: A link between probability data association filtering and the evidence theory [ONERA-NT-1990-11] p 3798 N93-31427

Adaptive array processing in uncertain inhomogeneous media 1992-1993 [AD-A265256] p 3717 N93-31794

Development of jitter measurement procedures for digital fiber optic modules [AD-A265550] p 3824 N93-31915

Neural attentional sensory processing [AD-A265163] p 3799 N93-31992

Multivariate problems of statistics, combinatorics, reliability, and signal processing [AD-A265213] p 3811 N93-32003

Linear algebra for signal processing [AD-A264677] p 3808 N93-32017

Deinterleaver technology for future Electronic Support Measures (ESM) systems [AD-A265005] p 3721 N93-32079

Near bottom data collection and data analysis [AD-A265872] p 3771 N93-32172

Determination of design and operation parameters for upper atmospheric research instrumentation to yield optimum resolution with deconvolution, appendix 3 [NASA-CR-192835] p 3766 N93-32231

Performance measures of parallel digital signal processor systems [AD-A265804] p 3718 N93-32313

Antenna size, transmitter power, and solid state transmitter considerations in affordable radar design [AD-A264397] p 3718 N93-32414

SIGNAL TO NOISE RATIOS

Determination of design and operation parameters for upper atmospheric research instrumentation to yield optimum resolution with deconvolution, appendix 3 [NASA-CR-192835] p 3766 N93-32231

SIGNAL TRANSMISSION

Development and flight testing of a fault-tolerant fly-by-light yaw control system p 3676 N93-31280

SIGNATURES

Static and dynamic loop models and their observational signatures p 3873 N93-31377

SILICATES

Interactions between tetraalkylammonium ions and silicates [ETN-93-94057] p 3703 N93-31622

The mineralogy and formation processes of Mars soil p 3861 N93-31934

Dehydroxylated clay silicates on Mars: Riddles about the Martian regolith solved with ferrian saponites p 3862 N93-31937

Applications analysis report: Silicate Technology Corporation's solidification/stabilization technology for organic and inorganic contaminants in soils [PB93-172948] p 3715 N93-32408

SILICON

Low voltage electron beam lithography [AD-A263360] p 3719 N93-31080

An integrated eddy current detection and imaging system on a silicon chip p 3693 N93-31560

Si/SiO2 interface studies by immersion ellipsometry [AD-A265151] p 3710 N93-31991

Si atomic layer epitaxy based on Si2H6 and remote He plasma bombardment [DE93-011674] p 3830 N93-32183

SILICON CARBIDES

Thermal shock and fatigue behavior of ceramic tubes p 3739 N93-31139

SiC fiber-reinforced Celsian glass-ceramic matrix composite [NASA-CASE-LEW-15264-1] p 3700 N93-31293

Method of producing a ceramic fiber-reinforced glass-ceramic matrix composite [NASA-CASE-LEW-15264-2] p 3700 N93-31299

Investigation of the electrochemical polarisation behaviour of SiC/6061 Al metal matrix composites [NPL-DMM(A)-31] p 3700 N93-31736

The development of SiC whisker fabrication technology for nuclear applications [DE93-605320] p 3710 N93-31828

Damping mechanisms in chemically vapor deposited SiC fibers [NASA-TM-109236] p 3701 N93-32219

SILICON DIOXIDE

Si/SiO2 interface studies by immersion ellipsometry [AD-A265151] p 3710 N93-31991

SIMULATED ANNEALING

Design of coupled mace filters for optical pattern recognition using practical spatial light modulators [NASA-CR-193192] p 3823 N93-31841

SIMULATION

Contact mechanics and the dynamics of manipulation p 3733 N93-31103

Automated failure mode effects and criticality analyses for reliability prediction of multibody mechanical systems p 3738 N93-31107

Quality support tool of simulation models: A comparison between methodology [REPT-92-061/BIS] p 3839 N93-31605

Selection by simulation: A work sample approach to the selection of process algebras [ISBN-9-09-005483-9] p 3811 N93-31618

SIMULATORS

Assessment of a human computer interface prototyping environment [NASA-CR-192612] p 3784 N93-31849

Numerical simulation of the flow in a 1:57-scale axisymmetric model of a large blast simulator [AD-A265551] p 3685 N93-31916

Data communication network at the ASRM facility [NASA-CR-193625] p 3686 N93-32236

Implementation of interconnect simulation tools in spice [NASA-CR-193619] p 3792 N93-32239

SINGLE CRYSTALS

NTO polymorphs [DE93-005451] p 3712 N93-31186

The effect of porosity and gamma-gamma' eutectic content on the low cycle fatigue behavior of hydrogen-charged PWA-1480 p 3696 N93-31576

Secondary orientation effects in a single crystal superalloy under mechanical and thermal loads p 3696 N93-31578

Fatigue in single crystal nickel superalloys [AD-A265451] p 3706 N93-31795

Infrared spectroscopy of hydrogen and water on diamond (100)
[AD-A265531] p 3704 N93-31920
Investigation of diamond homoepitaxy by in situ Fizeau interferometry: The role of oxygen
[AD-A265544] p 3829 N93-31921
Single crystal tungsten kinetic energy penetrators
[DE93-012570] p 3706 N93-32296

SINGLE EVENT UPSETS
An on-line expert system for diagnosing environmentally induced spacecraft anomalies using CLIPS
p 3794 N93-32142

SINKS
Mars brine formation experiment
p 3864 N93-31949

SINTERING
Tetragonal zirconia ceramics in Zr O2-Ce O2 system (CP): Preparation, characterization, and mechanical properties
[DE93-606833] p 3708 N93-31089
Non-destructive, ultra-low resistance, thermally stable contacts for use on shallow junction InP solar cells
[NASA-TM-106228] p 3750 N93-32201

SISO (CONTROL SYSTEMS)
A decoupled control approach for magnetic suspension systems using electromagnets mounted in a planar array
[NASA-TM-109011] p 3715 N93-32227

SITE SELECTION
Reconnaissance and deep-drill site selection on Taylor Dome, Antarctica p 3759 N93-31883

SITTING POSITION
Transmission of vibration through the human body to the head: A summary of experimental data
[ISVR-TR-218] p 3774 N93-32237

SKY SURVEYS (ASTRONOMY)
Using machine learning techniques to automate sky survey catalog generation p 3843 N93-32143

SLAGS
Viscosities of molten slags
[NPL-DMM(A)-55] p 3705 N93-31321
Thermal conductivities of slags
[NPL-DMM(A)-68] p 3705 N93-31322
Electrical conductivities of molten slags
[NPL-DMM(A)-79] p 3705 N93-31324
Diffusion coefficients in molten slags
[NPL-DMM(A)-82] p 3703 N93-31603

SLEEP
C-141 aircrew sleep and fatigue during the Persian Gulf conflict p 3782 N93-32265
The effects of cockpit heat on aviator sleep parameters p 3782 N93-32266
Human factors and the safety of flights: The importance of the management of sleep p 3782 N93-32267

SLIDING FRICTION
Fast Fourier Transform analysis of computer-acquired friction data
[DE93-010337] p 3736 N93-32179
Tribological characteristics of perfluoropolyether liquid lubricants under sliding conditions in high vacuum
[NASA-TM-106257] p 3711 N93-32352

SMOKE
Survey of smoking habits in the Spanish Air Force
p 3781 N93-32262

SMOKE DETECTORS
Fire protection for launch facilities using machine vision fire detection p 3687 N93-32113

SMOOTHING
Numerical study of a multigrid method with four smoothing methods for the incompressible Navier-Stokes equations in general coordinates
[REPT-93-04] p 3725 N93-31547
An ILU smoother for the incompressible Navier-Stokes equations in general coordinates
[REPT-92-91] p 3725 N93-31634
The method of smoothing applied to composite rough surface
[AD-A265236] p 3701 N93-32062

SOBOLEV SPACE
Sobolev-type orthogonal polynomials with a small number of real zeros
[REPT-92-64] p 3806 N93-31549
Point interactions on bounded domains
[REPT-92-97] p 3807 N93-31654
A remark about the mean curvature
[DE93-619668] p 3809 N93-32285

SOCIOLOGY
Man, technology, society and development: From the hunters and gatherers to the first industrial revolution 3.5 million years ago into AD1760
[ISBN-9-03-860102-6] p 3833 N93-31543

SODIUM CHLORIDES
HREM study of crystallography of titanium and titanium hydride thin films
[DE93-609038] p 3828 N93-31176

SOFTWARE ENGINEERING
Object oriented application flow graphs and their semantics
[CT-92-01] p 3788 N93-31528
Science Information Systems Newsletter, issue 28
[NASA-TM-108266] p 3834 N93-31589
Development of a case tool to support decision based software development
[NASA-CR-193289] p 3790 N93-31738
Formal specification and verification of concurrent programs
[AD-A265201] p 3790 N93-31793
An overview of PCTE: A basis for a Portable Commo n Tool Environment
[AD-A265202] p 3791 N93-32000
System engineering concept demonstration, security study, volume 7
[AD-A265473] p 3791 N93-32007
System engineering concept demonstration, effort summary, volume 1
[AD-A265467] p 3791 N93-32022
System engineering concept demonstration, system engineering needs, volume 2
[AD-A265468] p 3791 N93-32023
System engineering concept demonstration, interface standards studies, volume 4
[AD-A265470] p 3791 N93-32024
Research in transparent informed prefetching
[AD-A265417] p 3842 N93-32049
Petite amateur naval satellite spacecraft digital control system: A hardware design
[AD-A265234] p 3690 N93-32061
Advanced Artificial Intelligence Technology Testbed
p 3801 N93-32126
PERTS: A Prototyping Environment for Real-Time Systems p 3794 N93-32147
ARIES: Acquisition of Requirements and Incremental Evolution of Specifications p 3794 N93-32157
Initial definition of a Knowledge-Based Software Quality Assistant
[AD-A265866] p 3793 N93-32418
The reuse of large-scale components
[REPT-92-95] p 3793 N93-32419

SOFTWARE RELIABILITY
Building Hadamard matrices in steps of 4 to order 200
[PB93-189835] p 3786 N93-31200
Formal specification and verification of concurrent programs
[AD-A265201] p 3790 N93-31793
Experimental analysis of computer system dependability
[NASA-CR-193401] p 3785 N93-32233
Initial definition of a Knowledge-Based Software Quality Assistant
[AD-A265866] p 3793 N93-32418

SOFTWARE REUSE
Development of a case tool to support decision based software development
[NASA-CR-193289] p 3790 N93-31738
Automation and hypermedia technology applications
p 3843 N93-32155
The reuse of large-scale components
[REPT-92-95] p 3793 N93-32419

SOFTWARE TOOLS
Fuzzy Control/Space Station automation
p 3688 N93-31440
The Delfi3 debugger: Notes on the implementation
[REPT-92-106] p 3790 N93-31850
System engineering concept demonstration, effort summary, volume 1
[AD-A265467] p 3791 N93-32022
Knowledge-based software development tools
[AD-A265218] p 3791 N93-32059
Intelligent assistance in scientific data preparation
p 3843 N93-32144
The Knowledge-Based Software Assistant: Beyond CASE p 3794 N93-32156

SOHO MISSION
Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition
[ESA-SP-348] p 3867 N93-31343
SOHO overview and preparation for operations
p 3867 N93-31344
SUMER: Temperatures, densities, and velocities in the outer solar atmosphere p 3867 N93-31346
The coronal diagnostic spectrometer for the Solar and Heliospheric Observatory p 3868 N93-31347
Solar corona synoptic observations from SOHO with an extreme ultraviolet imaging telescope
p 3868 N93-31348
UVCS: The ultraviolet coronograph spectrometer for SOHO p 3868 N93-31349
The Large Angle Spectroscopic Coronagraph (LASCO): Visible light coronal imaging and spectroscopy
p 3868 N93-31350
SWAN: A study of solar wind anisotropies
p 3868 N93-31351
The Charge, Element, and Isotope Analysis System CELIAS on SOHO p 3869 N93-31352
COSTEP: Comprehensive suprathermal and energetic particle analyser for SOHO: Scientific goals and data description p 3869 N93-31353
A model for coronal streamer observations using the SOHO coronagraph instrumentation
p 3870 N93-31361
Ly-alpha radiation from coronal transients
p 3870 N93-31363
Sungrazing comet observations associated with SOHO
p 3871 N93-31369
Eclipse observations of the outer solar corona and the SOHO mission p 3872 N93-31371
Bayesian analysis of SOHO spectra
p 3876 N93-31398
Design for a complete SOHO mission under the ISTP
p 3880 N93-31424
Some European activities in support of the SOHO mission p 3880 N93-31425
The SOHO interdisciplinary science matrix
p 3880 N93-31426
Study of the Solar-Terrestrial System
[ESA-SP-346] p 3852 N93-31674
Coordination of the solar terrestrial science by the IACG: Inter-Agency Consultative Group for Space Science
p 3852 N93-31675
Reconnection in the solar corona
p 3855 N93-31695
Co-ordinated data handling for the UK participants in the Cluster mission p 3843 N93-31713
CELIAS: Charge, Element and Isotope Analysis System for the SOHO mission p 3860 N93-31725

SOIL MOISTURE
ESTAR: The Electronically Scanned Thinned Array Radiometer for remote sensing measurement of soil moisture and ocean salinity
[NASA-TM-4523] p 3747 N93-32362

SOILS
Preferential flow effects on chemical transport and retardation in soils
[PB93-190668] p 3723 N93-31204
Chemical dehalogenation treatment: Base-Catalyzed Decomposition Process (BCDP)
[PB93-182939] p 3751 N93-31432
MSATT Workshop on Chemical Weathering on Mars
[NASA-CR-193209] p 3861 N93-31933
The mineralogy and formation processes of Mars soil
p 3861 N93-31934
Effects of the chemical environment on the spectroscopic properties of clays: Applications for Mars
p 3862 N93-31936
Implications for volcanogenic volatile release on the weathering of Mars p 3862 N93-31939
Effect of DCB extraction on Mossbauer and spectral data for a Hawaiian palagonitic soil (PN-9): Iden tification of pigmentary phases p 3864 N93-31950
Systematic variations in the spectral properties of bright regions on Mars p 3864 N93-31951
Chemical transport during formation and alteration of Martian impact and volcanic deposits
p 3865 N93-31953
Infrared optical properties of Mars soil analog materials: Palagonites p 3866 N93-31957
Weathering processes implied from analysis of small Martian avalanche chutes p 3866 N93-31960
Chemical reactivity of the Martian soil
p 3867 N93-31963
In-situ bioventing: Two US EPA and Air Force sponsored field studies
[PB93-194231] p 3754 N93-32089
Applications analysis report: Silicate Technology Corporation's solidification/stabilization technology for organic and inorganic contaminants in soils
[PB93-172948] p 3715 N93-32408

SOLAR ACTIVITY
Radio observations of coronal streamers
p 3870 N93-31359
Morphology of coronal loop interactions
p 3873 N93-31379
Active region studies with coordinated SOHO, microwave, and magnetograph observations
p 3873 N93-31380
First ionization potential fractionation
p 3878 N93-31411
Coronal abundances in solar active regions measured by the Solar Maximum Mission flat crystal spectrometer
p 3879 N93-31416
Coronagraphic ground based support for SOHO at the Pic-du-Midi Observatory (France) p 3880 N93-31420
The SOHO interdisciplinary science matrix
p 3880 N93-31426

Solar-geophysical data number 583, March 1993. Part 1: (Prompt reports). Data for February, January 1993, and late data
[PB93-188894] p 3881 N93-31436
Solar-geophysical data number 583, March 1993. Part 2: (Comprehensive reports). Data for September 1992 and miscellaneous
[PB93-188902] p 3881 N93-31437

SOLAR ACTIVITY EFFECTS
Origin of the solar wind and coronal mass ejections p 3856 N93-31702

SOLAR ATMOSPHERE
SUMER: Temperatures, densities, and velocities in the outer solar atmosphere p 3867 N93-31346
The coronal diagnostic spectrometer for the Solar and Heliospheric Observatory p 3868 N93-31347
COSTEP: Comprehensive suprathermal and energetic particle analyser for SOHO: Scientific goals and data description p 3869 N93-31353
CDS and SUMER observations of fine structure and dynamics of loops: Experience from HRTS p 3873 N93-31376
Static and dynamic loop models and their observational signatures p 3873 N93-31377
What can we learn from the shape of loops? p 3874 N93-31386
Effects of hydrogen and electron diffusion on trace species diffusion in the solar atmosphere p 3878 N93-31413
Nonlinear interaction of Alfven waves in solar atmosphere p 3860 N93-31724
Study of an optimized configuration for interferometric imaging of complex and extended solar structures p 3849 N93-31780

SOLAR CELLS
Large-area, triple-junction a-Si alloy production scale-up
[DE93-010007] p 3750 N93-32177
Non-destructive, ultra-low resistance, thermally stable contacts for use on shallow junction InP solar cells
[NASA-TM-106228] p 3750 N93-32201

SOLAR COLLECTORS
The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 2, part 1
[PB93-174787] p 3748 N93-31070

SOLAR COOLING
The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 2, part 1
[PB93-174787] p 3748 N93-31070
The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 3, part 1
[PB93-174803] p 3748 N93-31104
International Energy Agency Solar Heating and Cooling Program
[DE93-010175] p 3750 N93-32282

SOLAR CORONA
Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition
[ESA-SP-348] p 3867 N93-31343
SOHO overview and preparation for operations p 3867 N93-31344
The solar oscillations investigation: Michelson Doppler imager p 3867 N93-31345
The coronal diagnostic spectrometer for the Solar and Heliospheric Observatory p 3868 N93-31347
Solar corona synoptic observations from SOHO with an extreme ultraviolet imaging telescope p 3868 N93-31348
The Large Angle Spectroscopic Coronagraph (LASCO): Visible light coronal imaging and spectroscopy p 3868 N93-31350
Theory of coronal streamer formation p 3869 N93-31355
Streamer eclipse observations p 3869 N93-31357
Radio observations of coronal streamers p 3870 N93-31359
Predicting Ly-alpha intensities in coronal streamers p 3870 N93-31360
A model for coronal streamer observations using the SOHO coronagraph instrumentation p 3870 N93-31361
Modelling the large scale structure of the solar corona p 3870 N93-31362
Ly-alpha radiation from coronal transients p 3870 N93-31363
Observational constraints on coronal hole density model p 3871 N93-31364
Observations of stationary radio sources: Coronal polar plumes? p 3871 N93-31365
A magnetostatic coronal model with horizontal electric currents: Modeling the coronal streamer belt p 3871 N93-31366
Simulated O VI Doppler dimming measurements of coronal outflow velocities p 3871 N93-31367
Speeds and accelerations of coronal mass ejections p 3871 N93-31368
Preliminary observations of solar type 2 bursts with the new radiospectrograph in Tremsdorf (Germany) p 3872 N93-31370
Eclipse observations of the outer solar corona and the SOHO mission p 3872 N93-31371
The solar corona structures as inferred from July 11, 1991 total solar eclipse observation p 3872 N93-31372
Observation of a coronal streamer at meter and decimeter wavelengths p 3872 N93-31373
Models of coronal streamers at meter-decameter wavelengths p 3872 N93-31374
On the Fabry-Perot investigations of the solar corona: Eclipse observations of the green line intensities and half widths p 3872 N93-31375
CDS and SUMER observations of fine structure and dynamics of loops: Experience from HRTS p 3873 N93-31376
The prominence-corona interface: Models and observations p 3873 N93-31378
The physics of solar prominences p 3874 N93-31383
Observations of the quiet Sun from the soft x ray telescope on Yohkoh p 3874 N93-31388
Observations of the solar corona with a high resolution EUV imaging spectrograph p 3875 N93-31390
A comparison of the dynamical signatures of coronal heating mechanisms p 3875 N93-31394
Multi-thermal emission associated with a limb prominence following two subflares and a coronal mass ejection p 3876 N93-31399
Fast computation of magnetohydrostatic equilibria using Euler potentials and multigrid methods p 3877 N93-31401
Temperature measurements in the inner corona p 3877 N93-31402
General properties of the polarization of the Fe 14 5303 A coronal emission line p 3877 N93-31404
Microflares observed with UVSP and HXIS p 3877 N93-31405
A diagnostic method for reconnecting magnetic fields in the solar corona p 3877 N93-31406
Abundance determination in the quiet corona p 3877 N93-31407
Photospheric abundances p 3878 N93-31408
Energetic particle observations and the abundances of elements in the solar corona p 3878 N93-31410
Coronal abundances in solar active regions measured by the Solar Maximum Mission flat crystal spectrometer p 3879 N93-31416
The July 11, 1991 solar corona observed in polarized white light: Preliminary results p 3879 N93-31417
Objectives of RESIK solar concave soft x ray spectrometer for Coronas-F mission p 3879 N93-31418
Coronagraphic ground based support for SOHO at the Pic-du-Midi Observatory (France) p 3880 N93-31420
Measuring electron temperature in the extended corona p 3880 N93-31422
Design for a complete SOHO mission under the ISTP p 3880 N93-31424
Study of the Solar-Terrestrial System
[ESA-SP-346] p 3852 N93-31674
Retardation effects and the origin of filament oscillations p 3853 N93-31679
Reconnection in the solar corona p 3855 N93-31695
Origin of the solar wind and coronal mass ejections p 3856 N93-31702
Multiple flows in the solar transition region p 3857 N93-31704
Coronal mass ejecta and flares: A statistical study p 3859 N93-31716
Possible manifestation of the critical ionization velocity phenomenon in the solar corona p 3861 N93-31726

SOLAR CORPUSCULAR RADIATION
Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition
[ESA-SP-348] p 3867 N93-31343
Theory of coronal streamer formation p 3869 N93-31355
Modeling solar coronal streamers p 3869 N93-31356
Streamer eclipse observations p 3869 N93-31357
Ground-based coronagraphic observations of solar streamers p 3870 N93-31358
Radio observations of coronal streamers p 3870 N93-31359
Predicting Ly-alpha intensities in coronal streamers p 3870 N93-31360
A model for coronal streamer observations using the SOHO coronagraph instrumentation p 3870 N93-31361
A magnetostatic coronal model with horizontal electric currents: Modeling the coronal streamer belt p 3871 N93-31366
Observation of a coronal streamer at meter and decimeter wavelengths p 3872 N93-31373
Models of coronal streamers at meter-decameter wavelengths p 3872 N93-31374
Interplanetary hydrogen gas as a monitor of the Sun's corpuscular and radiative output p 3878 N93-31412

SOLAR COSMIC RAYS
A double-peaked solar flare: Conclusions on particle transport p 3879 N93-31415

SOLAR CYCLES
Ionospheric control of the long-term occurrence of Pc1 pulsations observed on ground p 3860 N93-31722

SOLAR ECLIPSES
Streamer eclipse observations p 3869 N93-31357
Eclipse observations of the outer solar corona and the SOHO mission p 3872 N93-31371
The solar corona structures as inferred from July 11, 1991 total solar eclipse observation p 3872 N93-31372
On the Fabry-Perot investigations of the solar corona: Eclipse observations of the green line intensities and half widths p 3872 N93-31375
The July 11, 1991 solar corona observed in polarized white light: Preliminary results p 3879 N93-31417

SOLAR ENERGY
The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 2, part 1
[PB93-174787] p 3748 N93-31070
The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 3, part 1
[PB93-174803] p 3748 N93-31104
The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 3, part 2
[PB93-174811] p 3748 N93-31105
Coronal mass ejecta and flares: A statistical study p 3859 N93-31716

SOLAR ENERGY CONVERSION
The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 3, part 1
[PB93-174803] p 3748 N93-31104

SOLAR FLARES
A numerical model of interaction of coronal transients with the solar wind p 3874 N93-31385
3D reconstruction methods of coronal structures by radio observations p 3874 N93-31387
Pulse-beam heating in flare loops p 3875 N93-31392
Microflares observed with UVSP and HXIS p 3877 N93-31405
A double-peaked solar flare: Conclusions on particle transport p 3879 N93-31415
Solar-geophysical data number 583, March 1993. Part 1: (Prompt reports). Data for February, January 1993, and late data
[PB93-188894] p 3881 N93-31436
Solar-geophysical data number 583, March 1993. Part 2: (Comprehensive reports). Data for September 1992 and miscellaneous
[PB93-188902] p 3881 N93-31437
Solar coronal magnetic structure p 3852 N93-31676
Heliospheric current sheet effects on the propagation of solar-generated shock waves p 3854 N93-31685
Reconnection in the solar corona p 3855 N93-31695
Coronal mass ejecta and flares: A statistical study p 3859 N93-31716
On the Bernstein modes generation in solar post-flare loops p 3859 N93-31718
Three-dimensional numerical simulation of interplanetary magnetic field changes at 1 AU as a consequence of simulated solar flares p 3860 N93-31723
Possible manifestation of the critical ionization velocity phenomenon in the solar corona p 3861 N93-31726

SOLAR FLUX
Satellite Test Assistant Robot (STAR) p 3690 N93-32111

SOLAR GRAVITATION
Thermal profiles of coronal loops: Gravitational considerations p 3873 N93-31381
Study of the second-order relativistic light deflection of the Sun using long-baseline fibre-linked interferometers: Laser-Interferometric Solar Relativity (LISOR) test p 3849 N93-31778

SOLAR HEATING
The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 3, part 1
[PB93-174803] p 3748 N93-31104
Coronal heating: The role of resonant absorption
p 3876 N93-31396
Solar coronal magnetic structure
p 3852 N93-31676
Retardation effects and the origin of filament oscillations p 3853 N93-31679
International Energy Agency Solar Heating and Cooling Program
[DE93-010175] p 3750 N93-32282

SOLAR HOUSES
The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 3, part 1
[PB93-174803] p 3748 N93-31104

SOLAR INSTRUMENTS
The SUN/SIMURIS interferometer
p 3845 N93-31759

SOLAR INTERIOR
SOHO overview and preparation for operations
p 3867 N93-31344
The solar oscillations investigation: Michelson Doppler imager p 3867 N93-31345

SOLAR LIMB
Multi-thermal emission associated with a limb prominence following two subflares and a coronal mass ejection p 3876 N93-31399

SOLAR MAGNETIC FIELD
The solar oscillations investigation: Michelson Doppler imager p 3867 N93-31345
Theory of coronal streamer formation
p 3869 N93-31355
Modeling solar coronal streamers
p 3869 N93-31356
Modelling the large scale structure of the solar corona
p 3870 N93-31362
The physics of solar prominences
p 3874 N93-31383
Mass motion of a heated plasma blob in a coronal loop p 3874 N93-31384
Dynamic formation and magnetic support of loop or arcade prominences p 3875 N93-31391
Temperature dependent morphology of untwisted coronal loops p 3875 N93-31393
Evolution and oscillations of coronal loops
p 3876 N93-31395
The magnetothermal stability of radially stratified line-tied coronal loops p 3876 N93-31400
Fast computation of magnetohydrostatic equilibria using Euler potentials and multigrid methods
p 3877 N93-31401
General properties of the polarization of the Fe 14 5303 A coronal emission line p 3877 N93-31404
A diagnostic method for reconnecting magnetic fields in the solar corona p 3877 N93-31406
Automatic recognition of solar features
p 3880 N93-31421
Solar-geophysical data number 583, March 1993. Part 1: (Prompt reports). Data for February, January 1993, and late data
[PB93-188894] p 3881 N93-31436
Development of a large field-of-view KD potassium di-deuterium phosphate modulator: Center Director's Discretionary Fund
[NASA-TM-108410] p 3824 N93-32378

SOLAR MAXIMUM MISSION
Microflares observed with UVSP and HXIS
p 3877 N93-31405
Coronal abundances in solar active regions measured by the Solar Maximum Mission flat crystal spectrometer
p 3879 N93-31416

SOLAR NEUTRINOS
A 17 keV neutrino and large magnetic moment solution of the solar neutrino puzzle
[DE93-608264] p 3819 N93-31662

SOLAR OBSERVATORIES
Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition
[ESA-SP-348] p 3867 N93-31343
The Large Angle Spectroscopic Coronagraph (LASCO): Visible light coronal imaging and spectroscopy
p 3868 N93-31350
Eclipse observations of the outer solar corona and the SOHO mission p 3872 N93-31371
Coronagraphic ground based support for SOHO at the Pic-du-Midi Observatory (France) p 3880 N93-31420
SeaWiFS technical report series. Volume 10: Modeling of the SeaWiFS solar and lunar observations
[NASA-TM-104566-VOL-10] p 3770 N93-31859

SOLAR OSCILLATIONS
The solar oscillations investigation: Michelson Doppler imager p 3867 N93-31345
Evolution and oscillations of coronal loops
p 3876 N93-31395
Retardation effects and the origin of filament oscillations p 3853 N93-31679

SOLAR PHYSICS
Streamer eclipse observations p 3869 N93-31357
Modelling the large scale structure of the solar corona
p 3870 N93-31362
The physics of solar prominences
p 3874 N93-31383
The SOHO interdisciplinary science matrix
p 3880 N93-31426
The lunar interferometer for solar physics
p 3847 N93-31768
Advanced lunar-based interferometer for solar observations p 3847 N93-31769
High resolution solar physics p 3848 N93-31775

SOLAR PROMINENCES
The prominence-corona interface: Models and observations p 3873 N93-31378
The physics of solar prominences
p 3874 N93-31383
Radiative modeling of solar prominences, two-dimensional transfer plus partial frequency redistribution p 3875 N93-31389
Dynamic formation and magnetic support of loop or arcade prominences p 3875 N93-31391
Multi-thermal emission associated with a limb prominence following two subflares and a coronal mass ejection p 3876 N93-31399
The magnetothermal stability of radially stratified line-tied coronal loops p 3876 N93-31400
Automatic recognition of solar features
p 3880 N93-31421
Solar coronal magnetic structure
p 3852 N93-31676
Retardation effects and the origin of filament oscillations p 3853 N93-31679

SOLAR PROTONS
Solar wind heavy ions and proton/alpha particle relations observed onboard the Prognoz 7 satellite
p 3879 N93-31414
Spectra and structure functions of temperature fluctuations in the inner solar wind p 3860 N93-31720

SOLAR RADIATION
SUMER: Temperatures, densities, and velocities in the outer solar atmosphere p 3867 N93-31346
Ly-alpha radiation from coronal transients
p 3870 N93-31363
Observations of stationary radio sources: Coronal polar plumes? p 3871 N93-31365
Pulse-beam heating in flare loops
p 3875 N93-31392
Abundance determination in the quiet corona
p 3877 N93-31407
Interplanetary hydrogen gas as a monitor of the Sun's corpuscular and radiative output p 3878 N93-31412
Measuring electron temperature in the extended corona p 3880 N93-31422

SOLAR RADIO BURSTS
Preliminary observations of solar type 2 bursts with the new radiospectrograph in Tremsdorf (Germany)
p 3872 N93-31370
Solar-geophysical data number 583, March 1993. Part 2: (Comprehensive reports). Data for September 1992 and miscellaneous
[PB93-188902] p 3881 N93-31437

SOLAR RADIO EMISSION
Preliminary observations of solar type 2 bursts with the new radiospectrograph in Tremsdorf (Germany)
p 3872 N93-31370
Solar-geophysical data number 583, March 1993. Part 1: (Prompt reports). Data for February, January 1993, and late data
[PB93-188894] p 3881 N93-31436

SOLAR SPECTROMETERS
Coronal abundances in solar active regions measured by the Solar Maximum Mission flat crystal spectrometer
p 3879 N93-31416
Objectives of RESIK solar concave soft x ray spectrometer for Coronas-F mission
p 3879 N93-31418
Some European activities in support of the SOHO mission p 3880 N93-31425

SOLAR TERRESTRIAL INTERACTIONS
The SOHO interdisciplinary science matrix
p 3880 N93-31426
Study of the Solar-Terrestrial System
[ESA-SP-346] p 3852 N93-31674
Coordination of the solar terrestrial science by the IACG: Inter-Agency Consultative Group for Space Science
p 3852 N93-31675
Detecting and tracking changes in solar wind conditions using interplanetary scintillation p 3857 N93-31703

SOLAR WIND
Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition
[ESA-SP-348] p 3867 N93-31343
SOHO overview and preparation for operations
p 3867 N93-31344
UVCS: The ultraviolet coronograph spectrometer for SOHO p 3868 N93-31349
SWAN: A study of solar wind anisotropies
p 3868 N93-31351
The Charge, Element, and Isotope Analysis System CELIAS on SOHO p 3869 N93-31352
Energetic particle analyser ERNE
p 3869 N93-31354
A model for coronal streamer observations using the SOHO coronagraph instrumentation
p 3870 N93-31361
Modelling the large scale structure of the solar corona
p 3870 N93-31362
Ly-alpha radiation from coronal transients
p 3870 N93-31363
A numerical model of interaction of coronal transients with the solar wind p 3874 N93-31385
Temperature measurements in the inner corona
p 3877 N93-31402
Solar wind abundances from Ulysses
p 3878 N93-31409
Solar wind heavy ions and proton/alpha particle relations observed onboard the Prognoz 7 satellite
p 3879 N93-31414
Interaction of solar wind ions with thin carbon foils: Calibration of time-of-flight spectrometers
p 3880 N93-31423
Study of the Solar-Terrestrial System
[ESA-SP-346] p 3852 N93-31674
Energetics of ULF/ELF plasma waves in the solar wind and outer Earth's magnetosphere p 3826 N93-31689
Energetic particles (greater than 34 KeV - 3.2 MeV) in the deep Martian magnetotail (X = 15.5 R(sub M)), modeling of the Martian bow shock and the influence of low solar wind pressure on Mars as an obstacle
p 3855 N93-31691
Can ULF fluctuations observed at the magnetopause play a role in anomalous diffusion?
p 3855 N93-31693
On the solar wind-magnetosphere-ionosphere coupling: AMPTE/CCE particle data and the AE indices
p 3856 N93-31701
Origin of the solar wind and coronal mass ejections
p 3856 N93-31702
Detecting and tracking changes in solar wind conditions using interplanetary scintillation p 3857 N93-31703
Mass, momentum and energy transport from the Sun to the Earth by different types of the solar wind: Prognoz 7 observations p 3857 N93-31705
Solar wind penetration to geostationary altitude during the March 1991 magnetic storm p 3857 N93-31706
Spectra and structure functions of temperature fluctuations in the inner solar wind p 3860 N93-31720
Calibration of a detector system for solar energetic particles analysis p 3860 N93-31721
CELIAS: Charge, Element and Isotope Analysis System for the SOHO mission p 3860 N93-31725

SOLAR WIND VELOCITY
Observations of the solar corona with a high resolution EUV imaging spectrograph p 3875 N93-31390
Temperature measurements in the inner corona
p 3877 N93-31402
A diagnostic method for reconnecting magnetic fields in the solar corona p 3877 N93-31406

SOLAR X-RAYS
Observations of the quiet Sun from the soft x ray telescope on Yohkoh p 3874 N93-31388
Solar-geophysical data number 583, March 1993. Part 2: (Comprehensive reports). Data for September 1992 and miscellaneous
[PB93-188902] p 3881 N93-31437

SOLID ELECTROLYTES
New alternative for electricity production. Part 3: Electricity production from biomass and natural gas by a solid oxide fuel cell
[VTT-TIED-1397] p 3720 N93-31862
Advanced alternate planar geometry solid oxide fuel cells
[DE93-000248] p 3721 N93-32174

SOLID MECHANICS
Contact mechanics and the dynamics of manipulation
p 3733 N93-31103

SOLID PROPELLANT ROCKET ENGINES
Radiation/convection coupling in rocket motor and plume analysis
[NASA-CR-193288] p 3698 N93-31845

SOLID PROPELLANTS
A summary of the JANNAF Workshop on Methods for Exchange of Gun Propellant Burning Rate Information
[AD-A264113] p 3713 N93-32030
SOLID ROCKET PROPELLANTS
Radiation/convection coupling in rocket motor and plume analysis
[NASA-CR-193288] p 3698 N93-31845
SOLID SOLUTIONS
Electron-microscopic investigations of irradiated and naturally aged aluminum alloy
[DE93-606752] p 3706 N93-31660
SOLID WASTES
RCRA implementation plan, FY 1993
[PB93-176956] p 3752 N93-31877
SOLID-SOLID INTERFACES
Si/SiO2 interface studies by immersion ellipsometry
[AD-A265151] p 3710 N93-31991
SOLIDIFICATION
Applications analysis report: Silicate Technology Corporation's solidification/stabilization technology for organic and inorganic contaminants in soils
[PB93-172948] p 3715 N93-32408
SOLIDIFIED GASES
The thermodynamic and structural contributions to the vacancy formation energies in hot rare gas solids
[DE93-604742] p 3827 N93-31086
SOLITARY WAVES
Exciton solitary waves in molecular crystals
[DE93-608693] p 3827 N93-31100
A study of capillary and capillary-gravity wind waves: Their structures, distributions, and energy balances
p 3771 N93-32215
SOLUBILITY
Solubility, viscosity and density of refrigerant/lubricant mixtures
[DE93-014771] p 3711 N93-32293
SOLVENT EXTRACTION
Innovative instrument design and applications in super-critical fluid chromatography and extraction
p 3704 N93-32327
SOUND DETECTING AND RANGING
An acoustic scattering code
[AD-A265863] p 3816 N93-32316
SOUND FIELDS
An efficient model for coupling structural vibrations with acoustic radiation
[NASA-CR-191452] p 3816 N93-31868
Experiments on a general thermoacoustic engine
[AD-A265864] p 3817 N93-32317
SOUND GENERATORS
Active control of flow induced resonance in continuous corrugated tubes
[AD-A265782] p 3727 N93-32310
Experiments on a general thermoacoustic engine
[AD-A265864] p 3817 N93-32317
SOUND INTENSITY
Active control of flow induced resonance in continuous corrugated tubes
[AD-A265782] p 3727 N93-32310
SOUND PROPAGATION
Effects on health of noise disturbances due to air traffic p 3753 N93-31929
SOUND TRANSDUCERS
Instrumentation for in-flight acoustic measurements in an engine inlet duct of a Fokker 100 aircraft
[NLR-TP-91200-U] p 3680 N93-32332
SOUND TRANSMISSION
Active control of flow induced resonance in continuous corrugated tubes
[AD-A265782] p 3727 N93-32310
Transmission of sound through a rotor
[NLR-TP-92014-U] p 3683 N93-32386
SOUND WAVES
A first approximation to the effects of mean flow on sound propagation through cylindrical capillary tubes
[MATHS-REPT-A-181] p 3815 N93-31599
Acoustic logging for structural and hydrogeological bedrock investigations
[VTT-JULK-762] p 3816 N93-31865
An efficient model for coupling structural vibrations with acoustic radiation
[NASA-CR-191452] p 3816 N93-31868
Proceedings of the First Geological Materials Constitutive Modeling Workshop
[DE93-009161] p 3765 N93-32176
Effect of sound on boundary layer stability
[NASA-CR-193367] p 3816 N93-32238
SOUTHERN OSCILLATION
Coupled ocean-atmosphere GCM simulation of Southern Oscillation phenomena
[DE93-012583] p 3766 N93-32297
SPACE COMMERCIALIZATION
Hitchhiker: Customer Accommodations and Requirements Specifications (CARS)
[NASA-TM-109225] p 3834 N93-31644
SPACE DEBRIS
An on-line expert system for diagnosing environmentally induced spacecraft anomalies using CLIPS
p 3794 N93-32142
SPACE ENVIRONMENT SIMULATION
Mathematical simulation of the induced gamma-radiation in structural materials of spaceships
[DE93-606751] p 3688 N93-31076
Telescience pilot experiment results using telePODI
[NLR-TP-90326-U] p 3823 N93-31118
SPACE EXPLORATION
Thulium heat sources for space power application
[DE93-002249] p 3691 N93-31168
Searching for exoplanets p 3846 N93-31760
The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992)
[NASA-CP-3187-VOL-1] p 3883 N93-32097
SPACE LABORATORIES
Refine research plan for use of Atlas data
[NASA-CR-192611] p 3766 N93-32349
SPACE MISSIONS
Objectives of RESIK solar concave soft x ray spectrometer for Coronas-F mission
p 3879 N93-31418
Design for a complete SOHO mission under the ISTP
p 3880 N93-31424
Coordination of the solar terrestrial science by the IACG: Inter-Agency Consultative Group for Space Science
p 3852 N93-31675
Protocols for distributive scheduling
p 3835 N93-32129
Scheduling with partial orders and a causal model
p 3835 N93-32130
SPACE NAVIGATION
Stanford Aerospace Research Laboratory research overview p 3690 N93-32103
SPACE OBSERVATIONS (FROM EARTH)
Ground-based coronagraphic observations of solar streamers p 3870 N93-31358
Radio observations of coronal streamers
p 3870 N93-31359
The solar corona structures as inferred from July 11, 1991 total solar eclipse observation
p 3872 N93-31372
Targets for Space-Based Interferometry
[ESA-SP-354] p 3844 N93-31750
Prospects for Earth-based interferometry
p 3845 N93-31755
Comparative aspects of Earth- and space-based interferometry p 3845 N93-31756
Searching for exoplanets p 3846 N93-31760
Prospects for imaging and astrometry on the ground and implications for space interferometry
p 3848 N93-31776
High resolution imaging from the ground using a satellite-borne laser guide star p 3849 N93-31781
Exploring the limits of adaptive wavefront compensation for ground based astronomical interferometers
p 3849 N93-31782
SPACE PERCEPTION
The cube rotation test: A computer generated process for acquisition of mental spatial manipulator capability
p 3776 N93-31237
SPACE PLASMAS
The interaction of a moving spacecraft with the ionosphere: Current collection and wake structure
p 3688 N93-31157
Radiation from a dipole antenna into an inhomogeneous compressible and nonlinear space-plasma
[ESA-TT-1261] p 3716 N93-31341
Theory of coronal streamer formation
p 3869 N93-31355
A magnetostatic coronal model with horizontal electric currents: Modeling the coronal streamer belt
p 3871 N93-31366
Simulated O VI Doppler dimming measurements of coronal outflow velocities p 3871 N93-31367
Active region studies with coordinated SOHO, microwave, and magnetograph observations
p 3873 N93-31380
Mass motion of a heated plasma blob in a coronal loop p 3874 N93-31384
Microflares observed with UVSP and HXIS
p 3877 N93-31405
High resolution solar physics p 3848 N93-31775
High-latitude electric field studies using DMSP data
[AD-A265032] p 3763 N93-31996
A study of the magnetic field annihilation process in the magnetosphere and some geotechnical applications
[DE93-013172] p 3765 N93-32164
SPACE PLATFORMS
Remote surface inspection system
p 3739 N93-32099
SPACE POWER REACTORS
F2D: A two-dimensional compressible gas flow code
[DE93-003239] p 3723 N93-31169
The Thermionic Fuel Element Verification Program: Technical progress and future plans
[DE93-003797] p 3691 N93-31185
SPACE PROBES
Role of the INTERBALL small scale investigations in the GGS program p 3859 N93-31717
SPACE PROCESSING
Prometheus in space: Survey report of Research Committee on Functional New Material
p 3710 N93-31728
SPACE PROGRAMS
Targets for Space-Based Interferometry
[ESA-SP-354] p 3844 N93-31750
Searching for exoplanets p 3846 N93-31760
Structure and properties of energetic materials
[AD-A265775] p 3713 N93-31800
The Army and military in space
[AD-A264581] p 3812 N93-32013
JSC flight experiment recommendation in support of Space Station robotic operations p 3691 N93-32121
SPACE SHUTTLE MAIN ENGINE
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-10064] p 3692 N93-31552
Progress in the measurement of SSME turbine heat flux with plug-type sensors p 3692 N93-31553
Thin film heat flux sensor for Space Shuttle Main Engine turbine environment p 3693 N93-31554
Thin film thermocouples for high temperature turbine application p 3693 N93-31555
OPAD 1991 p 3693 N93-31559
Four dimensional reconstruction and analysis of plume images p 3694 N93-31561
Structural reliability methods: Code development status p 3694 N93-31563
Probabilistic evaluation of SSME structural components p 3694 N93-31565
Probabilistic structural analysis algorithm development for computational efficiency p 3695 N93-31569
Constitutive and damage material modeling in a high pressure hydrogen environment p 3696 N93-31577
Overview of aerothermodynamic loads definition study
p 3697 N93-31583
Three-dimensional analysis of the Pratt and Whitney alternate design SSME fuel turbine
p 3697 N93-31584
Three-dimensional flow calculations inside SSME GGGT first stage blade rows p 3697 N93-31585
Localization of aeroelastic modes in mistuned high-energy turbines p 3697 N93-31586
Heat transfer and pressure measurements for the SSME fuel turbine p 3698 N93-31587
Enhancements to the Engine Data Interpretation System (EDIS)
[NASA-CR-193363] p 3800 N93-32230
SPACE SHUTTLE ORBITERS
Space Shuttle Orbiter thermal protection system design and flight experience
[NASA-TM-104773] p 3727 N93-32198
Fuzzy based attitude controller for flexible spacecraft with on/off thrusters
[NASA-CR-188250] p 3690 N93-32228
SPACE SHUTTLE PAYLOADS
Refine research plan for use of Atlas data
[NASA-CR-192611] p 3766 N93-32349
SPACE SHUTTLES
An overview of the Kennedy Space Center robotics program p 3691 N93-32124
Ground Robotic Hand Applications for the Space Program study (GRASP)
[NASA-CR-193571] p 3737 N93-32235
SPACE SIMULATORS
Satellite Test Assistant Robot (STAR)
p 3690 N93-32111
SPACE STATION FREEDOM
Fuzzy Control/Space Station automation
p 3688 N93-31440
Space Station Freedom attitude determination and control system overview p 3689 N93-31447
Hyperbaric treatment p 3689 N93-31454
Assessment of a human computer interface prototyping environment
[NASA-CR-192612] p 3784 N93-31849
The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992)
[NASA-CP-3187-VOL-1] p 3883 N93-32097
Supervisory autonomous local-remote control system design: Near-term and far-term applications
p 3801 N93-32100
JSC flight experiment recommendation in support of Space Station robotic operations p 3691 N93-32121
On the design of fault-tolerant robotic manipulator systems p 3737 N93-32125
Implementing a real time reasoning system for robust diagnosis p 3739 N93-32138

Attention focussing and anomaly detection in real-time systems monitoring p 3730 N93-32139
Health maintenance facility system effectiveness testing
[NASA-TM-104737] p 3783 N93-32328
Microbiological and corrosion analysis of three urine pretreatment regimes with titanium 6A1-4V
[NASA-CR-192575] p 3783 N93-32356

SPACE STATION PAYLOADS
The SUN/SIMURIS interferometer p 3845 N93-31759

SPACE STATION PROPULSION
Blowdown thrust profile prediction p 3689 N93-31448

SPACE STATIONS
Workshop on Fuzzy Control Systems and Space Station Applications
[NASA-CR-193202] p 3688 N93-31439
Proximity operations in space station environment p 3689 N93-31449

SPACE TRANSPORTATION
System study of tether technology with particular consideration of transport utilization possibilities in space transportation
[ILR-MITT-270(1992)] p 3685 N93-31207

SPACE TRANSPORTATION SYSTEM
Technology transfer: Potential of BMFT concept for hypersonics
[MBB-LME-202-S-PUB-0505] p 3843 N93-31045
Evaluation of future space transportation systems with regard to their reliability and costs
[ESA-TT-1281] p 3687 N93-31593

SPACE TRANSPORTATION SYSTEM FLIGHTS
Fuzzy based attitude controller for flexible spacecraft with on/off thrusters
[NASA-CR-188250] p 3690 N93-32228

SPACE-TIME FUNCTIONS
2 + 1 gravity without dynamics
[DE92-642587] p 3757 N93-31081
Non-standard representations of the space-time groups and their applications to the dynamical theory of elementary particles
[DE93-608203] p 3818 N93-31240
A universal mass in (2+1)-dimensions
[DE93-609888] p 3832 N93-31911

SPACEBORNE ASTRONOMY
Active region studies with coordinated SOHO, microwave, and magnetograph observations p 3873 N93-31380
Observations of the quiet Sun from the soft x ray telescope on Yohkoh p 3874 N93-31388
Targets for Space-Based Interferometry
[ESA-SP-354] p 3844 N93-31750
Visible and infrared imaging interferometry from space p 3844 N93-31753
Submillimeter interferometry p 3845 N93-31754
Comparative aspects of Earth- and space-based interferometry p 3845 N93-31756
Interferometry from the Moon p 3845 N93-31757
Space-based astrometric optical interferometry with POINTS p 3845 N93-31758
The SUN/SIMURIS interferometer p 3845 N93-31759
Space Interferometry Science Working Group p 3846 N93-31761
Report on the ESA Interferometry Study Team activities p 3846 N93-31762
SISTERS: A space interferometer for the search for terrestrial exo-planets by rotation shearing p 3846 N93-31764
Report of the submillimeter splinter group p 3847 N93-31770
Summary of the splinter session on optical and UV science p 3848 N93-31773
High resolution solar physics p 3848 N93-31775
Prospects for imaging and astrometry on the ground and implications for space interferometry p 3848 N93-31776
P Cyg envelope and prospects of interferometric observations p 3848 N93-31777
HARDI: A High Angular Resolution Deployable Interferometer p 3850 N93-31786
A concept of deployable tethered interferometer p 3691 N93-31787
Interferometer concepts for astrometry in space p 3691 N93-31788
Prospects for stellar physics: Structure and influence of circumstellar media p 3850 N93-31789

SPACEBORNE EXPERIMENTS
Telescience pilot experiment results using telePODI
[NLR-TP-90326-U] p 3823 N93-31118
Potential low-cost telerobotics flight experiments p 3737 N93-32120
Refine research plan for use of Atlas data
[NASA-CR-192611] p 3766 N93-32349
Towards distributed control systems for experiments under micro gravity
[NLR-TP-92027-U] p 3714 N93-32387

SPACEBORNE TELESCOPES
Calibration of ORFEUS echelle spectrometer
[ETN-93-94201] p 3691 N93-31048
The SUN/SIMURIS interferometer p 3845 N93-31759
A concept of deployable tethered interferometer p 3691 N93-31787

SPACECRAFT CABIN ATMOSPHERES
Atmospheric control systems p 3689 N93-31456

SPACECRAFT CHARGING
The interaction of a moving spacecraft with the ionosphere: Current collection and wake structure p 3688 N93-31157

SPACECRAFT CONTAMINATION
A high thrust density, C60 cluster, ion thruster
[AD-A264405] p 3691 N93-31188

SPACECRAFT CONTROL
Path planning control p 3685 N93-31451
Petite amateur naval satellite spacecraft digital control system: A hardware design
[AD-A265234] p 3690 N93-32061
Fuzzy based attitude controller for flexible spacecraft with on/off thrusters
[NASA-CR-188250] p 3690 N93-32228

SPACECRAFT DESIGN
EHF military communication satellite alternatives study
[SS/L-TR00775] p 3716 N93-31311
Advanced launch system multi-path redundant avionics architecture analysis and characterization
[NASA-CR-4516] p 3795 N93-31642
Space-based astrometric optical interferometry with POINTS p 3845 N93-31758
Applications of structural optimization methods to fixed-wing aircraft and spacecraft in the 1980s
[NASA-TM-103939] p 3740 N93-32212
Enhanced methods for determining operational capabilities and support costs of proposed space systems
[NASA-CR-193265] p 3812 N93-32350

SPACECRAFT GUIDANCE
Stanford Aerospace Research Laboratory research overview p 3690 N93-32103

SPACECRAFT INSTRUMENTS
CELIAS: Charge, Element and Isotope Analysis System for the SOHO mission p 3860 N93-31725

SPACECRAFT LAUNCHING
Flammability and explosion limits of H2 and H2/CO: A literature review
[AD-A264896] p 3702 N93-31064

SPACECRAFT MAINTENANCE
A vision system planner for increasing the autonomy of the Extravehicular Activity Helper/Retriever
[NASA-CR-193301] p 3777 N93-31844
Potential roles for EVA and telerobotics in a unified worksite p 3690 N93-32118
JSC flight experiment recommendation in support of Space Station robotic operations p 3691 N93-32121
On the design of fault-tolerant robotic manipulator systems p 3737 N93-32125
A parametric analysis of endoatmospheric Low-Earth-Orbit maintenance
[AD-A265868] p 3685 N93-32319

SPACECRAFT MOTION
A new method for measuring the speed of the bow shock p 3854 N93-31687

SPACECRAFT PROPULSION
Fusion energy for space: Feasibility demonstration. A proposal to NASA
[NASA-TM-109227] p 3825 N93-31309
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-10064] p 3692 N93-31552
Overview of the fatigue/fracture/life prediction working group program at the Lewis Research Center p 3696 N93-31574
NASA's progress in nuclear electric propulsion technology
[NASA-TM-106272] p 3698 N93-31858
The applicability and availability of Former Soviet Union (FSU) space-related capabilities and facilities to energy-related space activities of Department of Energy, Department of Defense and National Aeronautics and Space Administration
[DE93-010286] p 3686 N93-32178

SPACECRAFT RELIABILITY
Enhanced methods for determining operational capabilities and support costs of proposed space systems
[NASA-CR-193265] p 3812 N93-32350

SPANWISE BLOWING
Experiments in the control of wing rock at high angle of attack using tangential leading edge blowing p 3683 N93-31068

SPATIAL FILTERING
Neural nets for aligning optical components in harsh environments: Beam smoothing spatial filter as an example p 3693 N93-31557

SPATIAL RESOLUTION
Combining qualitative and quantitative spatial and temporal information in a hierarchical structure: Approximate reasoning for plan execution monitoring p 3835 N93-32132

SPECIES DIFFUSION
Diffusion coefficients in molten slags
[NPL-DMM(A)-82] p 3703 N93-31603

SPECIFICATIONS
Hitchhiker: Customer Accommodations and Requirements Specifications (CARS)
[NASA-TM-109225] p 3834 N93-31644
Low cost guideways to Maglev
[PB93-154847] p 3735 N93-31727
The reuse of large-scale components
[REPT-92-95] p 3793 N93-32419

SPECKLE PATTERNS
Progress in speckle-shift strain measurement p 3693 N93-31558

SPECTRA
Systematic variations in the spectral properties of bright regions on Mars p 3864 N93-31951

SPECTRAL BANDS
Satellite Test Assistant Robot (STAR) p 3690 N93-32111

SPECTRAL EMISSION
The coronal diagnostic spectrometer for the Solar and Heliospheric Observatory p 3868 N93-31347
Atomic and molecular line observations of galaxies p 3847 N93-31771

SPECTRAL METHODS
On the Chebyshev collocation approximation and domain decomposition
[FFI-92/7032] p 3807 N93-31598
Determination of the electrostatic Green's function for stratified media
[REPT-92-067] p 3716 N93-31607
Numerical analysis of the spectral domain of transmission lines in dielectric layers
[REPT-92-068] p 3716 N93-31608

SPECTRAL REFLECTANCE
An unusual spectral unit in West Candor Chasma: Evidence for hydrothermal or aqueous alteration? p 3863 N93-31942
Location of nanophase Fe-oxides in palagonitic soils: Implication for Martian pigments p 3863 N93-31943
Reflectance spectroscopy and GEX simulation of palagonite and iron-rich montmorillonite clay mixtures: Implications for the surface composition of Mars p 3865 N93-31954

SPECTRAL SIGNATURES
A comparison of the dynamical signatures of coronal heating mechanisms p 3875 N93-31394
Four dimensional reconstruction and analysis of plume images p 3694 N93-31561

SPECTROGRAPHS
Pulse discriminator for crosstalk rejection in a multi-channel isochromat photoemission spectroscopy
[REPT-92-062] p 3719 N93-31253
Preliminary observations of solar type 2 bursts with the new radiospectrograph in Tremsdorf (Germany) p 3872 N93-31370
CDS and SUMER observations of fine structure and dynamics of loops: Experience from HRTS p 3873 N93-31376
Underneath coronal loops: MSDP observations coordinated with SERTS 4 and NIXT flights p 3876 N93-31397
Spectro-imagery with a Rotating Slip-Aperture Telescope (RSAT): Cophasing successive projections in the radon plane p 3849 N93-31779

SPECTROMETERS
Calibration of ORFEUS echelle spectrometer
[ETN-93-94201] p 3691 N93-31048
Evaluation of chemical conversion material (protective coating) exposed to space environmental conditions
[NASA-TM-108416] p 3730 N93-32366

SPECTROSCOPIC ANALYSIS
Bayesian analysis of SOHO spectra p 3876 N93-31398
EXAM: A two-state thermodynamic analysis program
[PB93-191658] p 3703 N93-31817
Study on laser atomic spectroscopy
[DE93-606193] p 3703 N93-31824
Vibrational overtone spectroscopy of cyclic amines: Pyridine and related compounds
[AD-A265524] p 3704 N93-31919
MSATT Workshop on Chemical Weathering on Mars
[NASA-CR-193209] p 3861 N93-31933
DLTS and dynamic transconductance analysis of deep-submicron fully-depleted SOI MOSFETs
[AD-A264888] p 3721 N93-31984

Si/SiO2 interface studies by immersion ellipsometry
[AD-A265151] p 3710 N93-31991
Synthesis and characterization of copolymers of nylon 11 and nylon 12
[AD-A265841] p 3711 N93-32314

SPECTROSCOPIC TELESCOPES
CDS and SUMER observations of fine structure and dynamics of loops: Experience from HRTS
p 3873 N93-31376
The International Stratospheric Laboratory for Astrophysics (ISLA): The cosmic microscope
p 3846 N93-31765

SPECTROSCOPY
The Large Angle Spectroscopic Coronagraph (LASCO): Visible light coronal imaging and spectroscopy
p 3868 N93-31350
Vibrational overtone spectroscopy of cyclic amines: Pyridine and related compounds
[AD-A265524] p 3704 N93-31919
Reflectance spectroscopy and GEX simulation of palagonite and iron-rich montmorillonite clay mixtures: Implications for the surface composition of Mars
p 3865 N93-31954
DLTS and dynamic transconductance analysis of deep-submicron fully-depleted SOI MOSFETs
[AD-A264888] p 3721 N93-31984

SPECTRUM ANALYSIS
On the feasibility of a transient dynamic design analysis
[AD-A264882] p 3733 N93-31101
QUASAR: An interactive program for spectrum analysis in personal computers
[DE93-609814] p 3786 N93-31248
Four dimensional reconstruction and analysis of plume images p 3694 N93-31561
Spectra and structure functions of temperature fluctuations in the inner solar wind p 3860 N93-31720
Spectral classification with the International Ultraviolet Explorer: An atlas of B-type spectra
[NASA-RP-1312] p 3861 N93-31737
Vibrational overtone spectroscopy of cyclic amines: Pyridine and related compounds
[AD-A265524] p 3704 N93-31919
Location of nanophase Fe-oxides in palagonitic soils: Implication for Martian pigments p 3863 N93-31943

SPEECH RECOGNITION
A segmental hidden Markov model for speech pattern processing
[RSRE-MEMO-4599] p 3716 N93-31610

SPEED CONTROL
Rotational speed control p 3689 N93-31457

SPICULES
Momentum transport through the chromosphere
p 3852 N93-31677

SPIN
Technique for measuring the spin rate of kinetic energy projectiles
[AD-A264114] p 3717 N93-32031
Novel spin effects in quantum chromodynamics
[DE93-010955] p 3833 N93-32181

SPIN EXCHANGE
Proceedings of the Workshop on Spin-Charge Transfer Reaction in Atomic Collision Process for planning of next period of cascade project
[DE93-704290] p 3821 N93-31834

SPIN-SPIN COUPLING
Microscopic origin of marginal Fermi-liquid in strongly correlated spin systems
[DE93-608697] p 3827 N93-31163

SPINOR GROUPS
On the Dirac equation in three dimensions
[DE93-609915] p 3813 N93-31181
Helicity amplitudes for matter-coupled gravity
[DE93-609932] p 3832 N93-32025

SPLINE FUNCTIONS
Curve interpolation with constrained length
[MEMO-1079] p 3804 N93-31467
Approximation orders of and approximation maps from local principal shift-invariant spaces
[AD-A265038] p 3808 N93-31999
Generalised curvature continuous rational cubics
[MATHS-REPT-A-180] p 3809 N93-32347

SPORADIC E LAYER
Meteor impacts, sporadic E layer formation and the incoherent scatter method
[IRF-SF-210] p 3852 N93-31624

SPOT (FRENCH SATELLITE)
Geographical and topographical data from satellite images used in developing a digital road topology database p 3745 N93-31266
SPOT satellite mapping of Ice Stream B
p 3760 N93-31887

SPRAY CHARACTERISTICS
Spray characteristics of two types of fuel injectors
[PB93-180859] p 3736 N93-32069

SPRAYED COATINGS
Plasma sprayed ceramic thermal barrier coating for NiAl-based intermetallic alloys
[NASA-CASE-LEW-15535-1] p 3705 N93-31294

SPREAD SPECTRUM TRANSMISSION
Petite amateur naval satellite spacecraft digital control system: A hardware design
[AD-A265234] p 3690 N93-32061

SQUALLS
Evolution of area-averaged vertical velocity in the convective region of a midlatitude squall line
[AD-A265333] p 3768 N93-32063

SQUEEZED STATES (QUANTUM THEORY)
Information-theoretic and Wigner function approaches to the nonclassical states dynamics for the variable frequency harmonic oscillator
[DE93-608166] p 3813 N93-31301

STABILITY
Instabilities and nonstatistical behavior in globally coupled systems
[DE93-608185] p 3831 N93-31302
Dehydroxylated clay silicates on Mars: Riddles about the Martian regolith solved with ferrian saponites
p 3862 N93-31937
The effect of sensory input on trajectories generated by recurrent neural networks
[AD-A264501] p 3799 N93-32036
Chemical and thermal stability of refrigerant-lubricant mixtures with metals
[DE93-013082] p 3715 N93-32163
Determination of the oxidative stability of perfluoropolyalkyl ethers and correlation with chemical structure
[NASA-TM-106223] p 3712 N93-32367

STABILITY DERIVATIVES
Advanced aircraft with thrust vector control
[MBB-FE-1-S-PUB-0504] p 3678 N93-31043

STAGNATION POINT
Time-varying reconnection in a stagnation-point flow geometry p 3827 N93-31697

STAGNATION PRESSURE
Initial results from the NASA-Lewis wave rotor experiment
[NASA-TM-106148] p 3683 N93-32368

STAINLESS STEELS
Corrosion-erosion of alloys exposed in fluidised bed combustors
[NPL-DMM(A)-80] p 3705 N93-31602

STANDARD DEVIATION
Use of titanium castings without a casting factor
[AD-A264414] p 3705 N93-31192

STANDARDIZATION
Metrication: An economic wake-up call for US industry
[PB93-188969] p 3714 N93-31109
Manual for data administration
[PB93-182053] p 3834 N93-31431
Standardization Directory: FSC class and area assignments
[AD-A265686] p 3839 N93-31796

STANDARDS
Calibration system for testing laboratory
[VTT-TIED-1401] p 3738 N93-31172
ENDF/B-6 neutron cross section measurement standards
[PB93-189868] p 3818 N93-31201
Temperature-electromotive force reference functions and tables for the letter-designated thermocouple types based on the ITS-90
[PB93-190338] p 3729 N93-31214
NIST scoring package certification procedures in conjunction with NIST special databases 2 and 6
[PB93-188126] p 3838 N93-31331
Surveillance schemes with applications to mass calibration
[PB93-181881] p 3810 N93-31430
Two new gas standards programs at the National Institute of Standards and Technology
[PB93-191427] p 3751 N93-31816
Standard Reference Materials: Handbook for SRM users
[PB93-183796] p 3699 N93-31830
The standards process: X3 information processing systems p 3840 N93-31966
The standards process: Technical committee X3B5 digital magnetic tape p 3840 N93-31967

STAR TRACKERS
Space Station Freedom attitude determination and control system overview p 3689 N93-31447

STARK EFFECT
An electrostatic mirror for neutral polar molecules
[DE93-609405] p 3818 N93-31228
The Optical Stark effect of the exciton due to dynamical coupling between quantized states of the electron and hole in quantum wells
[DE93-608520] p 3819 N93-31665

STATE VECTORS
Testing concept of a taxiing control system, summary
p 3676 N93-31278

STATIC LOADS
Development of nose structure of a reconnaissance container for a supersonic jet aircraft
[MBB-LME-242-S-PUB-0451] p 3679 N93-31046

STATIC PRESSURE
Heat transfer and pressure measurements for the SSME fuel turbine p 3698 N93-31587

STATISTICAL ANALYSIS
Building Hadamard matrices in steps of 4 to order 200
[PB93-189835] p 3786 N93-31200
Digital processing for positioning with one satellite
[ETN-93-93732] p 3685 N93-31318
Bayesian analysis of SOHO spectra
p 3876 N93-31398
Experimental evaluation of an arrival time difference lightning positioning system
[KNMI-WR-92-01] p 3767 N93-31600
GCM control run of UK Meteorological Office compared with the real climate in the NW European winter
[KNMI-WR-92-02] p 3767 N93-31601
Comparison of straight and 15 degree vectored nozzles using a six component thrust stand
[NASA-CR-193291] p 3725 N93-31641
On Short Large Amplitude Magnetic Structures in the vicinity of the quasi-parallel region of the Earth's bow shock p 3854 N93-31688
Low cycle fatigue behaviour of titanium disc alloys
p 3682 N93-31745
Statistics of mass production
[AD-A264365] p 3715 N93-31867
Application and validation of workload assessment techniques
[AD-A264575] p 3777 N93-32012
Statistical and numerical methods in control and identification
[AD-A264676] p 3811 N93-32016

STATISTICAL CORRELATION
Coronal mass ejecta and flares: A statistical study
p 3859 N93-31716

STATISTICAL DISTRIBUTIONS
Efficient estimation of the mean for interval censoring, case 2
[REPT-92-83] p 3811 N93-31491

STATISTICAL MECHANICS
Instabilities and nonstatistical behavior in globally coupled systems
[DE93-608185] p 3831 N93-31302

STEADY FLOW
Numerical simulations of three-dimensional laminar flow over a backward facing step; flow near side walls
[NASA-TM-106248] p 3723 N93-31147
A first approximation to the effects of mean flow on sound propagation through cylindrical capillary tubes
[MATHS-REPT-A-181] p 3815 N93-31599
A p-version finite element method for steady incompressible fluid flow and convective heat transfer
[NASA-TM-106260] p 3727 N93-32370

STEADY STATE
Steady states in the twin-well potential oscillator: Computer simulations and approximate analytical studies
[REPT-40/1992] p 3722 N93-32214

STEEL STRUCTURES
Web crippling of cold-formed steel members
[ISBN-9-03-860122-0] p 3705 N93-31540

STEELS
Ceramics models in the MESA codes
[DE93-000683] p 3711 N93-32186
Tribological characteristics of perfluoropolyether liquid lubricants under sliding conditions in high vacuum
[NASA-TM-106257] p 3711 N93-32352

STEFAN-BOLTZMANN LAW
Some historical notes about the Stefan problem
[REPT-93-07] p 3728 N93-32397

STELLAR COMPOSITION
Frequency of the chemical elements in B-stars of the local field and dispersion of interstellar medium
[ETN-93-94205] p 3852 N93-31091

STELLAR CORES
Structure, evolution, and stability of rotating protostars
p 3852 N93-31153

STELLAR ENVELOPES
Molecules in the envelope of planetary nebulae with the example of CO-envelope of M2-9
[ETN-93-94203] p 3851 N93-31050
Imaging circumstellar disks around young stars by multi-aperture interferometry p 3847 N93-31766
P Cyg envelope and prospects of interferometric observations p 3848 N93-31777
Prospects for stellar physics: Structure and influence of circumstellar media p 3850 N93-31789

STELLAR EVOLUTION
Molecules in the envelope of planetary nebulae with the example of CO-envelope of M2-9
[ETN-93-94203] p 3851 N93-31050
Frequency of the chemical elements in B-stars of the local field and dispersion of interstellar medium
[ETN-93-94205] p 3852 N93-31091
Structure, evolution, and stability of rotating protostars p 3852 N93-31153

STELLAR FLARES
Periodic x ray flares of NGC 6814: Gravitational lensing of an accreting neutron star?
[DE92-642586] p 3851 N93-31073

STELLAR MASS EJECTION
Speeds and accelerations of coronal mass ejections p 3871 N93-31368
Multi-thermal emission associated with a limb prominence following two subflares and a coronal mass ejection p 3876 N93-31399
Coronagraphic ground based support for SOHO at the Pic-du-Midi Observatory (France) p 3880 N93-31420
Origin of the solar wind and coronal mass ejections p 3856 N93-31702
Coronal mass ejecta and flares: A statistical study p 3859 N93-31716
Possible manifestation of the critical ionization velocity phenomenon in the solar corona p 3861 N93-31726

STELLAR MODELS
The physics of solar prominences p 3874 N93-31383
Mass motion of a heated plasma blob in a coronal loop p 3874 N93-31384

STELLAR PHYSICS
Prospects for stellar physics: Structure and influence of circumstellar media p 3850 N93-31789

STELLAR ROTATION
Spectral classification with the International Ultraviolet Explorer: An atlas of B-type spectra
[NASA-RP-1312] p 3861 N93-31737

STELLAR SPECTRA
Frequency of the chemical elements in B-stars of the local field and dispersion of interstellar medium
[ETN-93-94205] p 3852 N93-31091
Spectral classification with the International Ultraviolet Explorer: An atlas of B-type spectra
[NASA-RP-1312] p 3861 N93-31737

STELLAR SPECTROPHOTOMETRY
Frequency of the chemical elements in B-stars of the local field and dispersion of interstellar medium
[ETN-93-94205] p 3852 N93-31091

STELLAR STRUCTURE
Structure, evolution, and stability of rotating protostars p 3852 N93-31153
Quiet and active solar structures as observed at the bottom of the transition region p 3874 N93-31382

STELLAR WINDS
Spectral classification with the International Ultraviolet Explorer: An atlas of B-type spectra
[NASA-RP-1312] p 3861 N93-31737

STIFFNESS
Impact response of laminated plates subjected to transverse loading p 3740 N93-31645

STIFFNESS MATRIX
Design of multiple-ply laminated composite tapered beams
[NASA-TM-108411] p 3700 N93-31650

STOCHASTIC PROCESSES
Regularity of stochastic processes: A theory based on directional convexity
[REPT-92-70] p 3811 N93-31503
Probabilistic evaluation of SSME structural components p 3694 N93-31565
Blocking probabilities in a loss system with arrivals in geometrically distributed batches and heterogeneous service requirements
[MEMO-1074] p 3812 N93-32392

STOICHIOMETRY
Physical characterization and study of the electrical magnetic and thermal properties of the ceramic high Tc superconductor Y1Ba2Cu3O(7-x)
[DE92-640219] p 3711 N93-32187

STORAGE TANKS
Reusable cryogenic liquid rocket propellant tank
[NASA-CASE-LAR-14172-1] p 3692 N93-31295
Micromachined chemical sensor with integrated microelectronics
[DE93-013761] p 3730 N93-32306

STORMS (METEOROLOGY)
Evolution of area-averaged vertical velocity in the convective region of a midlatitude squall line
[AD-A265333] p 3768 N93-32063

STRAIN GAGES
Measurement of the out-of-plane shear response of thick section composite materials using the v-notched beam specimen
[AD-A264898] p 3699 N93-31065

STRAIN MEASUREMENT
Measurement of the out-of-plane shear response of thick section composite materials using the v-notched beam specimen
[AD-A264898] p 3699 N93-31065
Progress in speckle-shift strain measurement p 3693 N93-31558
Corrosion-erosion of alloys exposed in fluidised bed combustors
[NPL-DMM(A)-80] p 3705 N93-31602

STRANGE ATTRACTORS
Steady states in the twin-well potential oscillator: Computer simulations and approximate analytical studies
[REPT-40/1992] p 3722 N93-32214
Estimating the spatial extent of attractors of iterated function systems
[AD-A265856] p 3809 N93-32315

STRATEGIC MATERIALS
Availability of platinum and platinum-group metals
[PB93-189496] p 3743 N93-31115

STRATIFIED FLOW
Orographically forced internal-wave instability
[ISBN-0-315-73891-X] p 3757 N93-31106

STRATIGRAPHY
The diatom record from beneath the West Antarctic Ice Sheet and the global proxy perspective p 3759 N93-31882

STRATOCUMULUS CLOUDS
Wind profiling in a cloudy convective atmospheric boundary layer over land
[AD-A265422] p 3768 N93-32051

STRATOSPHERE
The International Stratospheric Laboratory for Astrophysics (ISLA): The cosmic microscope p 3846 N93-31765

STRATUS CLOUDS
Wind profiling in a cloudy convective atmospheric boundary layer over land
[AD-A265422] p 3768 N93-32051

STREAMS
The role of the margins in ice stream dynamics p 3761 N93-31896
Thermal control of ice-stream margins p 3762 N93-31897

STRESS (PHYSIOLOGY)
Selection of personnel for stressful occupations: The potential utility of psychophysiological measures as selection tools
[AD-A264571] p 3776 N93-32011

STRESS (PSYCHOLOGY)
Selection of personnel for stressful occupations: The potential utility of psychophysiological measures as selection tools
[AD-A264571] p 3776 N93-32011

STRESS ANALYSIS
Design of multiple-ply laminated composite tapered beams
[NASA-TM-108411] p 3700 N93-31650
The development of detection technique for fatigue crack due to thermal stratification phenomena in RCS piping
[DE93-605749] p 3740 N93-31823

STRESS CORROSION CRACKING
NASA-UVA Light Aerospace Alloy and Structures Technology Program (LA2ST)
[NASA-CR-193412] p 3706 N93-31739
Accelerated and real-time corrosion testing of aluminum-lithium alloys
[NLR-TP-91203-U] p 3707 N93-32385

STRESS DISTRIBUTION
Penn State axial flow turbine facility: Performance and nozzle flow field p 3698 N93-31588
The development of detection technique for fatigue crack due to thermal stratification phenomena in RCS piping
[DE93-605749] p 3740 N93-31823

STRESS-STRAIN DIAGRAMS
Low cycle fatigue behaviour of titanium disc alloys
[NLR-TP-91346-U] p 3683 N93-32372

STRESS-STRAIN RELATIONSHIPS
Deformation analysis of welded joints
[ETN-93-94199] p 3739 N93-31057

STRING THEORY
String-like excitations in quantum electrodynamics
[DE92-642593] p 3830 N93-31075
Constraints on cosmic strings due to black holes formed from collapsed cosmic string loops
[NASA-CR-193248] p 3861 N93-31837

STRONGLY COUPLED PLASMAS
Radiative preheat in strongly coupled, laser accelerated plasmas
[AD-A265442] p 3826 N93-32020

STRUCTURAL ANALYSIS
Deformation analysis of welded joints
[ETN-93-94199] p 3739 N93-31057
Optimal design and imperfection sensitivity of nonlinear shell structures
[FFA-TN-1992-30] p 3739 N93-31123
Structural reliability methods: Code development status p 3694 N93-31563
Probabilistic load simulation: Code development status p 3694 N93-31564
Probabilistic evaluation of SSME structural components p 3694 N93-31565
Commercialization of NESSUS: Status p 3695 N93-31567
Probabilistic structural analysis algorithm development for computational efficiency p 3695 N93-31569
Mapping methods for computationally efficient and accurate structural reliability p 3695 N93-31572
Structural characterization of nylon 7 by solid-state NMR, DSC, and ATR-FTIR
[AD-A265800] p 3822 N93-32312

STRUCTURAL DESIGN
Development of nose structure of a reconnaissance container for a supersonic jet aircraft
[MBB-LME-242-S-PUB-0451] p 3679 N93-31046
GARTEUR 3D sheer layer experiment
[FFA-TN-1992-26] p 3671 N93-31052
Optimal design and imperfection sensitivity of nonlinear shell structures
[FFA-TN-1992-30] p 3739 N93-31123
Integrated structural design, vibration control, and aeroelastic tailoring by multiobjective optimization p 3739 N93-31137
Probabilistic evaluation of SSME structural components p 3694 N93-31565
Low cost guideways to Maglev
[PB93-154847] p 3735 N93-31727
Space Shuttle Orbiter thermal protection system design and flight experience
[NASA-TM-104773] p 3727 N93-32198
Applications of structural optimization methods to fixed-wing aircraft and spacecraft in the 1980s
[NASA-TM-103939] p 3740 N93-32212

STRUCTURAL DESIGN CRITERIA
Composites design handbook: Update
[ESA-PSS-03-1101-ISSUE-1-RE] p 3701 N93-31740

STRUCTURAL FAILURE
Web crippling of cold-formed steel members
[ISBN-9-03-860122-0] p 3705 N93-31540
Advanced alternate planar geometry solid oxide fuel cells
[DE93-000248] p 3721 N93-32174
GARTEUR compression behaviour of advanced CFRP
[NLR-TP-91290-U] p 3701 N93-32202

STRUCTURAL PROPERTIES (GEOLOGY)
Weathering processes implied from analysis of small Martian avalanche chutes p 3866 N93-31960

STRUCTURAL RELIABILITY
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-10064] p 3692 N93-31552
Structural reliability methods: Code development status p 3694 N93-31563
Commercialization of NESSUS: Status p 3695 N93-31567
Mapping methods for computationally efficient and accurate structural reliability p 3695 N93-31572
Probabilistic simulation of the human factor in structural reliability p 3696 N93-31573
Ageing aircraft research in the Netherlands
[NLR-TP-91443-U] p 3679 N93-32203

STRUCTURAL STRAIN
The development of detection technique for fatigue crack due to thermal stratification phenomena in RCS piping
[DE93-605749] p 3740 N93-31823
Low cycle fatigue behaviour of titanium disc alloys
[NLR-TP-91346-U] p 3683 N93-32372

STRUCTURAL VIBRATION
An efficient model for coupling structural vibrations with acoustic radiation
[NASA-CR-191452] p 3816 N93-31868
Noise from high speed maglev systems: Noise sources, noise criteria, preliminary design guidelines for noise control, and recommendations for acoustical test facility for maglev research
[PB93-154896] p 3736 N93-32193
Transmission of vibration through the human body to the head: A summary of experimental data
[ISVR-TR-218] p 3774 N93-32237
Vibrational power transmission in curved beams. Part 1: Theory
[ISVR-TR-208] p 3742 N93-32340

STUDENTS
Foreign participation in US Academic science and engineering: 1991
[PB93-186583] p 3833 N93-31328

SUBGIANT STARS
Spectral classification with the International Ultraviolet Explorer: An atlas of B-type spectra
[NASA-RP-1312] p 3861 N93-31737
SUBMERGED BODIES
Terminal project heat convection in thin cylinders
[DE93-609489] p 3723 N93-31245
A continuation method for computing non-linear 3-D free surface flows
[DE93-008704] p 3727 N93-32175
SUBMILLIMETER WAVES
Submillimeter interferometry p 3845 N93-31754
Report of the submillimeter splinter group p 3847 N93-31770
Submillimetre line observations of molecular clouds p 3848 N93-31772
SUBROUTINES
HELAS: HELicity amplitude subroutines for Feynman diagram evaluations
[DE93-715538] p 3813 N93-31166
SUBSIDENCE
Thermodynamic structure of subsidence inversions in the Atlantic subtropical anticyclone regime
[AD-A265406] p 3768 N93-32043
Land subsidence and problems affecting land use at Edwards Air Force Base and vicinity, California, 1990
[PB93-182236] p 3765 N93-32191
SUBSTITUTES
A new definition of SLDNF-resolution
[CT-92-03] p 3806 N93-31530
Materials compatibility and lubricants research on CFC-refrigerant substitutes
[DE93-014770] p 3711 N93-32292
SUBSTRATES
Carbon diffusion in uncoated and titanium nitride coated iron substrates during microwave plasma assisted chemical vapor deposition of diamond
[DE93-608934] p 3708 N93-31174
Investigation of trap emission kinetics MOS capacitors using a pump-probe charge integrating technique
[AD-A265198] p 3721 N93-31994
SULFATES
Mars brine formation experiment p 3864 N93-31949
SULFUR DIOXIDES
Proceedings: 1991 SO2 Control Symposium, volume 2, sessions 4 and 5A
[PB93-196103] p 3754 N93-32090
Proceedings: 1991 SO2 Control Symposium, volume 3, sessions 5B and 6
[PB93-196111] p 3755 N93-32091
Proceedings: 1991 SO2 Control Symposium, volume 4, session 7
[PB93-196129] p 3755 N93-32092
Proceedings: 1991 SO2 Control Symposium, volume 5, session 8
[PB93-196137] p 3755 N93-32093
Proceedings of the 1991 SO2 Control Symposium, volume 1
[PB93-196095] p 3755 N93-32168
SUN
The Charge, Element, and Isotope Analysis System CELIAS on SOHO p 3869 N93-31352
Sungrazing comet observations associated with SOHO p 3871 N93-31369
Models of coronal streamers at meter-decameter wavelengths p 3872 N93-31374
On the Fabry-Perot investigations of the solar corona: Eclipse observations of the green line intensities and half widths p 3872 N93-31375
Quiet and active solar structures as observed at the bottom of the transition region p 3874 N93-31382
Photospheric abundances p 3878 N93-31408
Study of an optimized configuration for interferometric imaging of complex and extended solar structures p 3849 N93-31780
SUNSPOTS
Multiple flows in the solar transition region p 3857 N93-31704
Ionospheric control of the long-term occurrence of Pc1 pulsations observed on ground p 3860 N93-31722
SUPERCOMPUTERS
Numerical methods for inverse problems in three-dimensional geophysical modeling, phase 2
[PB93-181584] p 3758 N93-31872
Measurements over distributed high performance computing and storage systems p 3841 N93-31977
SUPERCONDUCTING DEVICES
High temperature superconducting films and multilayers for electronics
[AD-A264410] p 3828 N93-31190
SUPERCONDUCTING FILMS
High temperature superconducting films and multilayers for electronics
[AD-A264410] p 3828 N93-31190
Study of improved critical currents and mechanical properties in YBaCuO superconductor with Ag or 211
[AD-A265749] p 3829 N93-31804
A study on the development of high T(sub c) superconducting materials
[DE93-606394] p 3720 N93-31825
SUPERCONDUCTIVITY
High temperature superconductivity: Concept, preparation and testing of high T(sub c) superconductor compounds and applications
[DE93-608696] p 3827 N93-31077
On the superconductivity existence within the Hubbard model
[DE93-613987] p 3830 N93-32280
BCS universal constants for high-temperature superconductivity
[DE92-642079] p 3830 N93-32405
SUPERCONDUCTORS
Electromagnetic response of a superconducting wire of finite length in a perpendicular applied AC magnetic field
[MEMO-1087] p 3716 N93-31516
SUPERCRITICAL FLUIDS
Innovative instrument design and applications in super-critical fluid chromatography and extraction p 3704 N93-32327
SUPERHIGH FREQUENCIES
Synthesis and realization of a monolithic active bandpass filter for the Ku band
[LAAS-92365] p 3719 N93-31173
SUPERLATTICES
Electronic Landau levels in quantum wells with periodically structured interfaces
[DE93-608514] p 3828 N93-31664
SUPERSONIC COMBUSTION RAMJET ENGINES
Analytical and experimental investigations of the oblique detonation wave engine concept
[NASA-TM-102839] p 3683 N93-32374
SUPERSONIC COMMERCIAL AIR TRANSPORT
Engine technology challenges for a 21st Century High-Speed Civil Transport
[NASA-TM-106216] p 3681 N93-31671
SUPERSONIC FLOW
Hypersonic engine component experiments in high heat flux, supersonic flow environment
[NASA-TM-106273] p 3726 N93-31860
SUPERSONIC JET FLOW
Streamwise vorticity generation and mixing enhancement in free jets by delta-tabs
[NASA-TM-106235] p 3672 N93-31648
Enhanced mixing of a rectangular supersonic jet by natural and induced screech
[NASA-TM-106245] p 3672 N93-31672
Calculations on unsteady type 4 interaction at Mach 8
[AD-A265214] p 3673 N93-32004
Control of jet noise
[NASA-CR-193552] p 3816 N93-32221
SUPERSONIC TRANSPORTS
NASA-UVa light aerospace alloy and structure technology program supplement: Aluminum-based materials for high speed aircraft
[NASA-CR-4517] p 3705 N93-31643
SUPERSYMMETRY
Radiative electroweak breaking and sparticle spectroscopy with tan(beta) is approximately equal to (m(sub t)) divided by (m(sub b))
[DE93-608399] p 3832 N93-31663
Supersymmetric construction of W-algebras from super Toda and WZNW theories
[DE93-608244] p 3808 N93-31819
SUPPORT SYSTEMS
Tracking filters for precision Electronic Support Measures (ESM) systems
[AD-A264089] p 3719 N93-31085
Investigations into database management system support for expert system shells, volumes 1 and 2 p 3835 N93-31108
Advanced launch system multi-path redundant avionics architecture analysis and characterization
[NASA-CR-4516] p 3795 N93-31642
System engineering concept demonstration, security study, volume 7
[AD-A265473] p 3791 N93-32007
Deinterleaver technology for future Electronic Support Measures (ESM) systems
[AD-A265005] p 3721 N93-32079
Automated Assembly Center (AAC) p 3686 N93-32123
SURFACE ACOUSTIC WAVE DEVICES
Micromachined chemical sensor with integrated microelectronics
[DE93-013761] p 3730 N93-32306
SURFACE DEFECTS
Surface degradation of polymeric materials
[NPL-DMM(A)-75] p 3709 N93-31323
Effects of surface defects on the local electric field in inhomogeneous media
[DE93-011035] p 3830 N93-32182
SURFACE DIFFUSION
Carbon diffusion in uncoated and titanium nitride coated iron substrates during microwave plasma assisted chemical vapor deposition of diamond
[DE93-608934] p 3708 N93-31174
SURFACE EMITTING LASERS
Surface-emitting laser-based optical switching: An update
[DE93-010689] p 3732 N93-32180
SURFACE ENERGY
Si atomic layer epitaxy based on Si2H6 and remote He plasma bombardment
[DE93-011674] p 3830 N93-32183
SURFACE NAVIGATION
Planetary rover developments at JPL p 3737 N93-32115
SURFACE PROPERTIES
Zirconia ceramics and mechanical surface interactions
[ETN-93-94049] p 3709 N93-31541
Reflectance spectroscopy and GEX simulation of palagonite and iron-rich montmorillonite clay mixtures: Implications for the surface composition of Mars p 3865 N93-31954
Surface roughness measuring systems
[VTT-TIED-1392] p 3748 N93-32420
SURFACE REACTIONS
Surface degradation of polymeric materials
[NPL-DMM(A)-75] p 3709 N93-31323
Infrared spectroscopy of hydrogen and water on diamond (100)
[AD-A265531] p 3704 N93-31920
Dehydroxylated clay silicates on Mars: Riddles about the Martian regolith solved with ferrian saponites p 3862 N93-31937
On the weathering of Martian igneous rocks p 3862 N93-31941
Improved gallium nitride and aluminum nitride electronic materials
[AD-A264570] p 3710 N93-32010
SURFACE ROUGHNESS
The method of smoothing applied to composite rough surface
[AD-A265236] p 3701 N93-32062
Polametric passive remote sensing of ocean surface
[AD-A265874] p 3746 N93-32173
Interactions between magnetically levitated vehicles and elevated guideway structures
[PB93-148542] p 3736 N93-32192
Effect of sound on boundary layer stability
[NASA-CR-193367] p 3816 N93-32238
Surface roughness measuring systems
[VTT-TIED-1392] p 3748 N93-32420
SURFACE TEMPERATURE
Heat transfer measurements using infra-red thermography in rarefied flows
[RAE-TM-W-1] p 3724 N93-31336
Recent changes of weather patterns in North America
[DE93-013982] p 3769 N93-32289
SURFACE VEHICLES
Remote driving with reduced bandwidth communication p 3719 N93-32114
SURFACE WATER
Three-dimensional modeling of pollutant transport in surface waters
[PB93-190627] p 3751 N93-31203
Mars brine formation experiment p 3864 N93-31949
SURFACTANTS
NMR studies of organic thin films
[AD-A264903] p 3707 N93-31066
SURGES
Ly-alpha radiation from coronal transients p 3870 N93-31363
Morphology of coronal loop interactions p 3873 N93-31379
SURVEILLANCE
Surveillance schemes with applications to mass calibration
[PB93-181881] p 3810 N93-31430
SURVEILLANCE RADAR
Antenna size, transmitter power, and solid state transmitter considerations in affordable radar design
[AD-A264397] p 3718 N93-32414
SURVEYS
Reports on Cartography and Topography, series 1, report no. 103
[ETN-90-97325] p 3744 N93-31256
The lifestyle and dietary consumption patterns of United States Air Force aviators within air training command at Randolph Air Force Base, Texas p 3780 N93-32257
Reaction to aircraft noise near general aviation airfields
[DORA-8203] p 3817 N93-32377

SURVIVAL
Optimization of 15 parameters influencing the long-term survival of bacteria in aquatic systems
[NASA-CR-192571] p 3772 N93-32365
SWEPT FORWARD WINGS
Integrated structural design, vibration control, and aeroelastic tailoring by multiobjective optimization
p 3739 N93-31137
SWEPT WINGS
GARTEUR 3D sheer layer experiment
[FFA-TN-1992-26] p 3671 N93-31052
SWITCHES
Surface-emitting laser-based optical switching: An update
[DE93-010689] p 3732 N93-32180
SYMBOLIC PROGRAMMING
The priority inversion problem and real-time symbolic model checking
[AD-A265408] p 3791 N93-32044
SYMBOLS
The test memorization of symbols and numbers: A computer generated test for visual sensitivity
p 3775 N93-31233
SYMMETRY
The effect of alkyl substituents on the macrocycle ring on enantiomeric recognition by chiral pyridino-18-crown-6 for 1-naphthylethylamine
[AD-A265513] p 3704 N93-31918
SYMPATHETIC NERVOUS SYSTEM
Melatonin, the pineal gland, and circadian rhythms
[AD-A264099] p 3772 N93-31061
SYNCHRONISM
Global synchronization algorithms for the Intel iPSC/860
[NASA-CR-193618] p 3793 N93-32361
SYNCHRONOUS PLATFORMS
Diagnostics of magnetic substorms using satellite observations of magnetic pulsations
[AD-A264300] p 3764 N93-32084
SYNCHROTRON RADIATION
Proceedings of the Workshop on Application of Circularly Polarized X Rays in the Region of 1 to 8 keV
[DE93-704276] p 3823 N93-31165
Adaptive optics for high power beam lines using diamond crystal monochromators
[DE93-009328] p 3824 N93-31987
SYNOPTIC MEASUREMENT
Solar corona synoptic observations from SOHO with an extreme ultraviolet imaging telescope
p 3868 N93-31348
SYNTAX
On the integration of algebraic and logic languages
[ETN-93-94238] p 3786 N93-31205
SYNTHESIS (CHEMISTRY)
Ion exchange polymers and method for making
[NASA-CASE-LEW-15576-1] p 3709 N93-31316
Synthesis and characterization of copolymers of nylon 11 and nylon 12
[AD-A265841] p 3711 N93-32314
SYNTHETIC APERTURE RADAR
Unclassified satellite remote sensing as a component of integrated treaty verification
[DE93-005736] p 3744 N93-31187
SYNTHETIC APERTURES
Spectro-imagery with a Rotating Slip-Aperture Telescope (RSAT): Cophasing successive projections in the radon plane p 3849 N93-31779
SYSTEM EFFECTIVENESS
Health maintenance facility system effectiveness testing
[NASA-TM-104737] p 3783 N93-32328
SYSTEM IDENTIFICATION
Set-membership identification for robust control design
[AD-A265669] p 3800 N93-32197
SYSTEMS ANALYSIS
Reduction method with system analysis for multiobjective optimization-based design
[NASA-CR-191456] p 3803 N93-31194
A generalized asymptoticity problem in max algebra, the general case
[REPT-92-76] p 3804 N93-31471
Sensitivity analysis of coupled bending and torsional vibrations in flexible robot arms
[MEMO-1088] p 3735 N93-31526
DESSY: Making a real-time expert system robust and useful p 3794 N93-32146
Enhanced methods for determining operational capabilities and support costs of proposed space systems
[NASA-CR-193265] p 3812 N93-32350
SYSTEMS ENGINEERING
Minimize system cost by choosing optimal subsystem reliability and redundancy
[NASA-TM-106251] p 3812 N93-31145
Flight test of avionic and air-traffic control systems
[ESA-TT-1279] p 3675 N93-31271
ATTAS experimental-cockpit and ATMOS for component and system investigations in flight guidance
p 3676 N93-31276
Testing of an experimental FMS p 3676 N93-31277
Pallet for helicopter test instrumentation
p 3676 N93-31279
Ground- and satellite-derived flight-path measurements as demonstrated in the AFES Avionics Flight Evaluation System (AFES) p 3677 N93-31281
Z through pictures
[RSRE-MEMO-4587] p 3787 N93-31337
Evaluation of future space transportation systems with regard to their reliability and costs
[ESA-TT-1281] p 3687 N93-31593
System engineering concept demonstration, security study, volume 7
[AD-A265473] p 3791 N93-32007
System engineering concept demonstration, effort summary, volume 1
[AD-A265467] p 3791 N93-32022
System engineering concept demonstration, system engineering needs, volume 2
[AD-A265468] p 3791 N93-32023
System engineering concept demonstration, interface standards studies, volume 4
[AD-A265470] p 3791 N93-32024
Parametric and combinatorial problems in constrained optimization
[AD-A265595] p 3792 N93-32096
Interactions between magnetically levitated vehicles and elevated guideway structures
[PB93-148542] p 3736 N93-32192
Maglev program test plan
[PB93-154904] p 3736 N93-32194
SYSTEMS INTEGRATION
Testing of an experimental FMS p 3676 N93-31277
SYSTEMS SIMULATION
Testing of an experimental FMS p 3676 N93-31277
SYSTEMS STABILITY
Robust stabilization of infinite-dimensional systems with respect to coprime factor perturbations
[W-9220] p 3805 N93-31514

T

TABS (CONTROL SURFACES)
Streamwise vorticity generation and mixing enhancement in free jets by delta-tabs
[NASA-TM-106235] p 3672 N93-31648
TACTICS
A high-fidelity, six-degree-of-freedom batch simulation environment for tactical guidance research and evaluation
[NASA-TM-4440] p 3684 N93-32380
TAKEOFF
Aircraft accident report: Takeoff stall in icing conditions. USAir Flight 405, Fokker F-28, N485US, LaGuardia Airport, Flushing, New York, 22 March 1992
[PB93-910402] p 3674 N93-32195
TANTALUM COMPOUNDS
Hierarchical textures in ferroelectric crystals
[DE93-608938] p 3827 N93-31175
TAPERING
Design of multiple-ply laminated composite tapered beams
[NASA-TM-108411] p 3700 N93-31650
TARGET RECOGNITION
Automatic Target Recognition (ATR) using Distributed Associative Memories (DAMS)
[AD-A265613] p 3800 N93-32169
TASK PLANNING (ROBOTICS)
A vision system planner for increasing the autonomy of the Extravehicular Activity Helper/Retriever
[NASA-CR-193301] p 3777 N93-31844
TASKS
Application and validation of workload assessment techniques
[AD-A264575] p 3777 N93-32012
Man-machine cooperation in advanced teleoperation
p 3784 N93-32106
The MICRO-BOSS scheduling system: Current status and future efforts p 3835 N93-32133
PERTS: A Prototyping Environment for Real-Time Systems p 3794 N93-32147
TAXIING
Testing concept of a taxiing control system, summary
p 3676 N93-31278
TECHNOLOGICAL FORECASTING
Forecasting and planning for changing patterns of Scientific and Technical Communication (STC)
p 3838 N93-31223
TECHNOLOGIES
Man, technology, society and development: From the hunters and gatherers to the first industrial revolution 3.5 million years ago into AD1760
[ISBN-9-03-860102-6] p 3833 N93-31543
TECHNOLOGY ASSESSMENT
LNG as a fuel for railroads: Assessment of technology status and economics
[PB93-188787] p 3713 N93-31434
Propulsion technology challenges for turn-of-the-century commercial aircraft
[NASA-TM-106192] p 3682 N93-32351
TECHNOLOGY TRANSFER
The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 3, part 2
[PB93-174811] p 3748 N93-31105
The effect of changes in markets and trade barriers on the exchange of scientific and technical information
p 3836 N93-31216
The modern research environment
p 3837 N93-31221
The applicability and availability of Former Soviet Union (FSU) space-related capabilities and facilities to energy-related space activities of Department of Energy, Department of Defense and National Aeronautics and Space Administration
[DE93-010286] p 3686 N93-32178
TECHNOLOGY UTILIZATION
Aircraft structures in 2000: A technological challenge?
[MBB-LME-202-S-PUB-0485] p 3679 N93-31058
Commercial applications p 3688 N93-31441
The application of synthetic-beacon technology to astronomy
[AD-A265146] p 3850 N93-31990
The technology base for agile manufacturing
p 3715 N93-32104
TEKTITES
Preliminary results of an experimental study of the interactions of basalt glass and a water vapor atmosphere: Implications for weathering on Mars
p 3864 N93-31948
TELECOMMUNICATION
Forecasting and planning for changing patterns of Scientific and Technical Communication (STC)
p 3838 N93-31223
TELECONFERENCING
Video conferencing made easy
[DE93-010798] p 3718 N93-32283
TELEMETRY
Ground installations for preparation and evaluation of flight tests p 3675 N93-31274
TELEOPERATORS
On board image processing for telescience support
[NLR-TP-91213-U] p 3823 N93-31056
The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992)
[NASA-CP-3187-VOL-1] p 3883 N93-32097
Supervisory autonomous local-remote control system design: Near-term and far-term applications
p 3801 N93-32100
Performance analysis of a robotic system for space-based assembly p 3801 N93-32101
Man-machine cooperation in advanced teleoperation
p 3784 N93-32106
Integration of advanced teleoperation technologies for control of space robots p 3784 N93-32107
Interactive and cooperative sensing and control for advanced teleoperation p 3784 N93-32108
Air Force research in human sensory feedback for telepresence p 3801 N93-32109
Air Force construction automation/robotics
p 3715 N93-32110
TeleOperator/telePresence System (TOPS) Concept Verification Model (CVM) development
p 3784 N93-32112
Real-time qualitative reasoning for telerobotic systems
p 3737 N93-32116
Potential roles for EVA and telerobotics in a unified worksite p 3690 N93-32118
Graphics simulation and training aids for advanced teleoperation p 3793 N93-32119
Potential low-cost telerobotics flight experiments
p 3737 N93-32120
RACE pulls for shared control p 3686 N93-32122
TELEROBOTICS
Remote surface inspection system
p 3739 N93-32099
Supervisory autonomous local-remote control system design: Near-term and far-term applications
p 3801 N93-32100
Performance analysis of a robotic system for space-based assembly p 3801 N93-32101
Man-machine cooperation in advanced teleoperation
p 3784 N93-32106

Air Force research in human sensory feedback for telepresence p 3801 N93-32109
Air Force construction automation/robotics p 3715 N93-32110
Satellite Test Assistant Robot (STAR) p 3690 N93-32111
TeleOperator/telePresence System (TOPS) Concept Verification Model (CVM) development p 3784 N93-32112
Remote driving with reduced bandwidth communication p 3719 N93-32114
Real-time qualitative reasoning for telerobotic systems p 3737 N93-32116
Potential roles for EVA and telerobotics in a unified worksite p 3690 N93-32118
Potential low-cost telerobotics flight experiments p 3737 N93-32120

TELESCOPES
The VLT interferometer: Current status and expectations for the next 20 years p 3846 N93-31763
The lunar interferometer for solar physics p 3847 N93-31768
Advanced lunar-based interferometer for solar observations p 3847 N93-31769
Spectro-imagery with a Rotating Slip-Aperture Telescope (RSAT): Cophasing successive projections in the radon plane p 3849 N93-31779
The application of synthetic-beacon technology to astronomy
[AD-A265146] p 3850 N93-31990
Decision-theoretic control of EUVE telescope scheduling p 3835 N93-32134

TELEVISION EQUIPMENT
Remote driving with reduced bandwidth communication p 3719 N93-32114

TELLURIC CURRENTS
Two and three dimensional magnetotelluric inversion
[DE93-013233] p 3765 N93-32165

TEMPERATE REGIONS
Thermodynamic structure of subsidence inversions in the Atlantic subtropical anticyclone regime
[AD-A265406] p 3768 N93-32043

TEMPERATURE CONTROL
Thermal control of ice-stream margins p 3762 N93-31897
Implementing a real time reasoning system for robust diagnosis p 3739 N93-32138

TEMPERATURE DEPENDENCE
Diffusion coefficients in molten slags
[NPL-DMM(A)-82] p 3703 N93-31603
Temperature dependence of the femtosecond optical response in doped high temperature superconductors
[DE93-009514] p 3829 N93-31988

TEMPERATURE DISTRIBUTION
A magnetostatic coronal model with horizontal electric currents: Modeling the coronal streamer belt p 3871 N93-31366
Thermal profiles of coronal loops: Gravitational considerations p 3873 N93-31381
Heat transfer and pressure measurements for the SSME fuel turbine p 3698 N93-31587

TEMPERATURE EFFECTS
A thermoelastic model for thick composite rings
[AD-A264112] p 3701 N93-32029
The effects of cockpit heat on aviator sleep parameters p 3782 N93-32266

TEMPERATURE INVERSIONS
Thermodynamic structure of subsidence inversions in the Atlantic subtropical anticyclone regime
[AD-A265406] p 3768 N93-32043

TEMPERATURE MEASUREMENT
Temperature-electromotive force reference functions and tables for the letter-designated thermocouple types based on the ITS-90
[PB93-190338] p 3729 N93-31214
SQUIDs in thermal detectors of weakly interacting particles
[DE93-609531] p 3729 N93-31247
High temperature, oxidation resistant noble metal-Al alloy thermocouple
[NASA-CASE-LEW-15515-1] p 3729 N93-31298
Heat transfer measurements using infra-red thermography in rarefied flows
[RAE-TM-W-1] p 3724 N93-31336
Temperature measurements in the inner corona p 3877 N93-31402
Measuring electron temperature in the extended corona p 3880 N93-31422
Rayleigh-Brillouin scattering for high-pressure gas temperature measurements p 3693 N93-31556
Spectra and structure functions of temperature fluctuations in the inner solar wind p 3860 N93-31720
Non-contact heat flux measurement using a transparent sensor
[NASA-TM-106252] p 3713 N93-32330

TEMPERATURE SCALES
Temperature-electromotive force reference functions and tables for the letter-designated thermocouple types based on the ITS-90
[PB93-190338] p 3729 N93-31214

TEMPORAL RESOLUTION
Combining qualitative and quantitative spatial and temporal information in a hierarchical structure: Approximate reasoning for plan execution monitoring p 3835 N93-32132

TENSILE STRENGTH
An investigation of squeeze-cast alloy 718
[NASA-TM-108412] p 3706 N93-31646

TENSILE TESTS
Perforated carbon-epoxy plates damage modeling for quasi-static biaxial loading
[ESA-TT-1273] p 3740 N93-31428
Material characterization and fractographic examination of Ti-17 fatigue crack growth specimens for SMP SC33 p 3681 N93-31744
Fatigue crack growth results for Ti-6Al-4V, IMI 685, and Ti-17 p 3682 N93-31746

TENSOR ANALYSIS
Some aspects of invariant theory in plasticity. Part 2: Constitutive relations for perfectly locking materials. Comments on perfectly plastic solids p 3742 N93-32321

TEREPHTHALATE
Liquid-crystalline main-chain polymers with flexible side chains: Synthesis, structure, processing and properties of poly(p-phenylene terephthalate)s with alkoxy side chains
[ETN-93-94041] p 3709 N93-31520

TERMINAL BALLISTICS
Single crystal tungsten kinetic energy penetrators
[DE93-012570] p 3706 N93-32296
The development of a tungsten heavy alloy that fails by an adiabatic shear mechanism, phase 1
[AD-A265867] p 3707 N93-32318

TERMINOLOGY
List of acronyms in environmental sciences
[KNMI-PUBL-180-ED-1] p 3838 N93-31596
Coordinating Council. Tenth Meeting: Information retrieval: The role of controlled vocabularies
[NASA-TM-108764] p 3843 N93-32403

TERMS
Coordinating Council. Tenth Meeting: Information retrieval: The role of controlled vocabularies
[NASA-TM-108764] p 3843 N93-32403

TERRAIN
A catalog of landscape features. A modeling instrument for the ATKIS information system p 3745 N93-31264
Chemical transport during formation and alteration of Martian impact and volcanic deposits p 3865 N93-31953
RATLER: Robotic All-Terrain Lunar Exploration Rover p 3737 N93-32117

TEST EQUIPMENT
Design review of fluid film bearing testers
[NASA-CR-193299] p 3735 N93-31731

TEST FACILITIES
Flight test of avionic and air-traffic control systems
[ESA-TT-1279] p 3675 N93-31271
The DLR test aircraft in the FZ-BS, -VFW 614/ATTAS, Dornier DO 228-101, MBB BO105 S-3 p 3675 N93-31272
The basic measurement equipment of the DLR test aircraft p 3675 N93-31273
Instigation and processing of flight tests in DLR p 3675 N93-31275
ATTAS experimental-cockpit and ATMOS for component and system investigations in flight guidance p 3676 N93-31276
Testing of an experimental FMS p 3676 N93-31277
Pallet for helicopter test instrumentation p 3676 N93-31279
Data communication network at the ASRM facility
[NASA-CR-193625] p 3686 N93-32236

TEST STANDS
Comparison of straight and 15 degree vectored nozzles using a six component thrust stand
[NASA-CR-193291] p 3725 N93-31641

TETHERED SATELLITES
Determination of design and operation parameters for upper atmospheric research instrumentation to yield optimum resolution with deconvolution. Appendix 7 --- Transform Domain Skiprope Observer for tethered satellites
[NASA-CR-192836] p 3756 N93-31041
A method to predict the orbital lifetimes of free tethers and tether-trailing satellites using artificial neural networks p 3687 N93-31069
System study of tether technology with particular consideration of transport utilization possibilities in space transportation
[ILR-MITT-270(1992)] p 3685 N93-31207
Tethered systems control p 3689 N93-31453
A concept of deployable tethered interferometer p 3691 N93-31787

TETHERING
System study of tether technology with particular consideration of transport utilization possibilities in space transportation
[ILR-MITT-270(1992)] p 3685 N93-31207
Tethered systems control p 3689 N93-31453

TEXTS
Automating multilingual communication p 3837 N93-31219

THEMATIC MAPPING
Monitoring vegetation greenness with satellite data
[PB93-190882] p 3744 N93-31213

THEOREM PROVING
Sequent calculi for normal modal propositional logics
[LP-92-12] p 3806 N93-31533
Generic modal resolution
[REPT-92-90] p 3807 N93-31635

THEOREMS
Undecidability of modal and intermediate first-order logics with two individual variables
[ML-92-06] p 3804 N93-31480

THEORETICAL PHYSICS
Convergence rates and finite-dimensional approximations for nonlinear ill-posed problems involving monotone operators in Banach spaces
[DE93-619670] p 3809 N93-32287

THERMAL ANALYSIS
Determination of the oxidative stability of perfluoropolyalkyl ethers and correlation with chemical structure
[NASA-TM-106223] p 3712 N93-32367
Thermal stability of lithiated vanadium oxide (LVO), gamma-lithium vanadium bronze (gamma-LiV2O5) and vanadium dioxide (VO2) thermal battery cathode materials
[RAE-TR-92047] p 3722 N93-32422

THERMAL BATTERIES
Thermal stability of lithiated vanadium oxide (LVO), gamma-lithium vanadium bronze (gamma-LiV2O5) and vanadium dioxide (VO2) thermal battery cathode materials
[RAE-TR-92047] p 3722 N93-32422

THERMAL CONDUCTIVITY
Thermal conductivities of slags
[NPL-DMM(A)-68] p 3705 N93-31322
Analysis of effective thermal conductivity of fibrous materials
[NASA-CR-193242] p 3709 N93-31636
Adaptive optics for high power beam lines using diamond crystal monochromators
[DE93-009328] p 3824 N93-31987

THERMAL CONTROL COATINGS
Plasma sprayed ceramic thermal barrier coating for NiAl-based intermetallic alloys
[NASA-CASE-LEW-15535-1] p 3705 N93-31294

THERMAL CYCLING TESTS
Progress in the measurement of SSME turbine heat flux with plug-type sensors p 3692 N93-31553

THERMAL EMISSION
Multi-thermal emission associated with a limb prominence following two subflares and a coronal mass ejection p 3876 N93-31399
Imaging circumstellar disks around young stars by multi-aperture interferometry p 3847 N93-31766
Polametric passive remote sensing of ocean surface
[AD-A265874] p 3746 N93-32173

THERMAL EXPANSION
Adaptive optics for high power beam lines using diamond crystal monochromators
[DE93-009328] p 3824 N93-31987

THERMAL FATIGUE
Thermal shock and fatigue behavior of ceramic tubes p 3739 N93-31139
Cumulative fatigue damage behavior of MAR M-247 p 3696 N93-31575
Secondary orientation effects in a single crystal superalloy under mechanical and thermal loads p 3696 N93-31578
Axial and torsional fatigue behavior of a cobalt-base alloy p 3697 N93-31582
Fatigue in single crystal nickel superalloys
[AD-A265451] p 3706 N93-31795

THERMAL INSTABILITY
The magnetothermal stability of radially stratified line-tied coronal loops p 3876 N93-31400

THERMAL INSULATION
Space Shuttle Orbiter thermal protection system design and flight experience
[NASA-TM-104773] p 3727 N93-32198

THERMAL PROTECTION
Space Shuttle Orbiter thermal protection system design and flight experience
[NASA-TM-104773] p 3727 N93-32198

THERMAL RESISTANCE
Microstructural studies of ceramic thermal carrier coatings; how it influences coatings thermomechanical resistance
[ONERA-NT-1992-9] p 3709 N93-31597
THERMAL SHOCK
Thermal shock and fatigue behavior of ceramic tubes
p 3739 N93-31139
THERMAL STABILITY
Chemical and thermal stability of refrigerant-lubricant mixtures with metals
[DE93-013082] p 3715 N93-32163
Non-destructive, ultra-low resistance, thermally stable contacts for use on shallow junction InP solar cells
[NASA-TM-106228] p 3750 N93-32201
Thermal stability of lithiated vanadium oxide (LVO), gamma-lithium vanadium bronze (gamma-LiV2O5) and vanadium dioxide (VO2) thermal battery cathode materials
[RAE-TR-92047] p 3722 N93-32422
THERMAL STRESSES
Thermal shock and fatigue behavior of ceramic tubes
p 3739 N93-31139
Axial and torsional fatigue behavior of a cobalt-base alloy p 3697 N93-31582
A thermoelastic model for thick composite rings
[AD-A264112] p 3701 N93-32029
THERMOCHEMISTRY
A summary of the JANNAF Workshop on Methods for Exchange of Gun Propellant Burning Rate Information
[AD-A264113] p 3713 N93-32030
THERMOCOUPLE PYROMETERS
Non-contact heat flux measurement using a transparent sensor
[NASA-TM-106252] p 3713 N93-32330
THERMOCOUPLES
Temperature-electromotive force reference functions and tables for the letter-designated thermocouple types based on the ITS-90
[PB93-190338] p 3729 N93-31214
High temperature, oxidation resistant noble metal-Al alloy thermocouple
[NASA-CASE-LEW-15515-1] p 3729 N93-31298
Thin film thermocouples for high temperature turbine application p 3693 N93-31555
THERMODYNAMIC EQUILIBRIUM
Thermodynamic analysis of processes proceeding on (111) faces of diamond during chemical vapour deposition
[DE93-609039] p 3708 N93-31177
THERMODYNAMIC PROPERTIES
Development of technical processes for manufacturing heavy metal fluoride glass fibers
[ETN-93-94200] p 3707 N93-31047
The thermodynamic and structural contributions to the vacancy formation energies in hot rare gas solids
[DE93-604742] p 3827 N93-31086
Thermodynamic analysis of processes proceeding on (111) faces of diamond during chemical vapour deposition
[DE93-609039] p 3708 N93-31177
Application of the SAHA equation to high temperature (greater than or equal to 6000 K) rocket exhaust
[AD-A264004] p 3692 N93-31291
The development of SiC whisker fabrication technology for nuclear applications
[DE93-605320] p 3710 N93-31828
Thermodynamic structure of subsidence inversions in the Atlantic subtropical anticyclone regime
[AD-A265406] p 3768 N93-32043
Physical characterization and study of the electrical magnetic and thermal properties of the ceramic high Tc superconductor Y1Ba2Cu3O(7-x)
[DE92-640219] p 3711 N93-32187
Enhancements to the Engine Data Interpretation System (EDIS)
[NASA-CR-193363] p 3800 N93-32230
Experiments on a general thermoacoustic engine
[AD-A265864] p 3817 N93-32317
THERMODYNAMICS
Modeling studies of ice-ocean dynamics and thermodynamics
[AD-A264084] p 3769 N93-31082
Contribution to the theoretical study and finite-element approximation of the multidimensional, multispecies, hyperbolic system of gas dynamics
[ESA-TT-1275] p 3724 N93-31429
EXAM: A two-state thermodynamic analysis program
[PB93-191658] p 3703 N93-31817
Stress-rupture behavior of small diameter polycrystalline alumina fibers
[NASA-TM-106256] p 3712 N93-32382
THERMOELASTICITY
A thermoelastic model for thick composite rings
[AD-A264112] p 3701 N93-32029
THERMOGRAPHY
Heat transfer measurements using infra-red thermography in rarefied flows
[RAE-TM-W-1] p 3724 N93-31336
THERMOMETERS
SQUIDs in thermal detectors of weakly interacting particles
[DE93-609531] p 3729 N93-31247
THERMOPHYSICAL PROPERTIES
Experiments on a general thermoacoustic engine
[AD-A265864] p 3817 N93-32317
THERMOPLASTIC RESINS
A thermoelastic model for thick composite rings
[AD-A264112] p 3701 N93-32029
THERMOREGULATION
Melatonin, the pineal gland, and circadian rhythms
[AD-A264099] p 3772 N93-31061
THESAURI
Coordinating Council. Tenth Meeting: Information retrieval: The role of controlled vocabularies
[NASA-TM-108764] p 3843 N93-32403
THICK FILMS
Affecting factors to the electrical properties of RuO2 thick-film resistors
[DE93-768332] p 3721 N93-32055
THICKNESS
The determination of the thickness of the film materials by the PIXE method
[DE93-607555] p 3823 N93-31090
Velocities of Thwaites and Land glaciers
p 3760 N93-31885
THIN FILMS
NMR studies of organic thin films
[AD-A264903] p 3707 N93-31066
The determination of the thickness of the film materials by the PIXE method
[DE93-607555] p 3823 N93-31090
HREM study of crystallography of titanium and titanium hydride thin films
[DE93-609038] p 3828 N93-31176
Thin film heat flux sensor for Space Shuttle Main Engine turbine environment p 3693 N93-31554
Thin film thermocouples for high temperature turbine application p 3693 N93-31555
Prometheus in space: Survey report of Research Committee on Functional New Material
p 3710 N93-31728
Functionalized polymeric materials for electronics and optics
[AD-A265788] p 3710 N93-31802
Study of improved critical currents and mechanical properties in YBaCuO superconductor with Ag or 211
[AD-A265749] p 3829 N93-31804
R and D status report: RF vacuum microelectronics
[AD-A264381] p 3721 N93-32033
Effects of surface defects on the local electric field in inhomogeneous media
[DE93-011035] p 3830 N93-32182
Method and apparatus for characterizing the quality for electrically thin semiconductor films
[AD-D015734] p 3830 N93-32206
Evaluation of chemical conversion material (protective coating) exposed to space environmental conditions
[NASA-TM-108416] p 3730 N93-32366
THIN WALLED SHELLS
Optimal design and imperfection sensitivity of nonlinear shell structures
[FFA-TN-1992-30] p 3739 N93-31123
THREAT EVALUATION
Intelligent security assessment for a mobile robot
[AD-A265003] p 3799 N93-32078
THREE BODY PROBLEM
The three-body problem in the ground-state representation
[DE93-608164] p 3803 N93-31289
THREE DIMENSIONAL FLOW
Numerical simulations of three-dimensional laminar flow over a backward facing step; flow near side walls
[NASA-TM-106248] p 3723 N93-31147
Overview of aerothermodynamic loads definition study
p 3697 N93-31583
Three-dimensional analysis of the Pratt and Whitney alternate design SSME fuel turbine
p 3697 N93-31584
Three-dimensional flow calculations inside SSME GGGT first stage blade rows p 3697 N93-31585
A continuation method for computing non-linear 3-D free surface flows
[DE93-008704] p 3727 N93-32175
THREE DIMENSIONAL MODELS
Three-dimensional modeling of pollutant transport in surface waters
[PB93-190627] p 3751 N93-31203
3D reconstruction methods of coronal structures by radio observations p 3874 N93-31387
Heliospheric current sheet effects on the propagation of solar-generated shock waves p 3854 N93-31685
Three-dimensional numerical simulation of interplanetary magnetic field changes at 1 AU as a consequence of simulated solar flares
p 3860 N93-31723
Regional modeling analysis of the dependencies of atmospheric oxidants to perturbations in NOx and hydrocarbon emissions
[PB93-180925] p 3754 N93-32070
THREE DIMENSIONAL MOTION
Characterisation and control of a flexible robot subject to torque ripple
[OUEL-1952/92] p 3734 N93-31156
THRESHOLDS (PERCEPTION)
A proposal on the quality of the binary thresholds of a contour detection
[REPT-91-075] p 3806 N93-31544
THROMBOSIS
Fundamental diagnostic hematology: The bleeding and clotting disorders (second edition)
[PB93-188670] p 3773 N93-31158
THRUST AUGMENTATION
Advanced aircraft with thrust vector control
[MBB-FE-1-S-PUB-0504] p 3678 N93-31043
THRUST CHAMBERS
Study of wall heat transfer from a high temperature dissociated hydrogen impinging jet
[DE92-017845] p 3698 N93-32184
THRUST CONTROL
Blowdown thrust profile prediction
p 3689 N93-31448
THRUST LOADS
Comparison of straight and 15 degree vectored nozzles using a six component thrust stand
[NASA-CR-193291] p 3725 N93-31641
Lubrication of an 85-mm ball bearing with RP-1
[NASA-TM-106254] p 3686 N93-31670
THRUST VECTOR CONTROL
Advanced aircraft with thrust vector control
[MBB-FE-1-S-PUB-0504] p 3678 N93-31043
Comparison of straight and 15 degree vectored nozzles using a six component thrust stand
[NASA-CR-193291] p 3725 N93-31641
A parametric analysis of endoatmospheric Low-Earth-Orbit maintenance
[AD-A265868] p 3685 N93-32319
THRUSTORS
Fuzzy based attitude controller for flexible spacecraft with on/off thrusters
[NASA-CR-188250] p 3690 N93-32228
THULIUM ISOTOPES
Thulium heat sources for space power application
[DE93-002249] p 3691 N93-31168
TIDES
Tides of Massachusetts and Cape Cod Bays
[AD-A264790] p 3770 N93-31983
TILT ROTOR AIRCRAFT
Definition of an airfoil family for the EUROFAR rotor
[DLR-FB-92-04] p 3679 N93-31197
Civil tiltrotor transport point design: Model 940A
[NASA-CR-191446] p 3701 N93-32234
TILTING ROTORS
Definition of an airfoil family for the EUROFAR rotor
[DLR-FB-92-04] p 3679 N93-31197
TIME DEPENDENCE
Multigrid schemes for time-dependent incompressible Navier-Stokes equations
[REPT-92-102] p 3725 N93-31657
Time-varying reconnection in a stagnation-point flow geometry p 3827 N93-31697
On waveform multigrid method
[NASA-CR-191455] p 3808 N93-31843
Investigation of trap emission kinetics MOS capacitors using a pump-probe charge integrating technique
[AD-A265198] p 3721 N93-31994
A decision-theoretic approach to the display of information for time-critical decisions: The Vista project
p 3784 N93-32152
Is time a real time? An overview of time ontology in informatics
[REPT-92-046] p 3842 N93-32383
Adaptive RLS identification with generalized forgetting techniques
[REPT-92-037] p 3810 N93-32390
TIME LAG
Supervisory autonomous local-remote control system design: Near-term and far-term applications
p 3801 N93-32100
Performance analysis of a robotic system for space-based assembly p 3801 N93-32101
Integration of advanced teleoperation technologies for control of space robots p 3784 N93-32107

TIME MEASUREMENT
Modeling industrial distributed control systems with Petri nets
[REPT-92-079] p 3714 N93-31465
TIME OF FLIGHT SPECTROMETERS
Interaction of solar wind ions with thin carbon foils: Calibration of time-of-flight spectrometers
p 3880 N93-31423
TIME SERIES ANALYSIS
Mean seasonal cycles and interannual variations at 0 deg, 165 deg E during 1986-1992
[PB93-186195] p 3768 N93-31874
TIME SHARING
Decay-usage scheduling in multiprocessor and distributed systems. 1: Theory
[REPT-92-105] p 3795 N93-31864
TIRES
The development of a ring model for the study of tire in-plane dynamics
[MEMT-20] p 3734 N93-31508
TITANIUM
HREM study of crystallography of titanium and titanium hydride thin films
[DE93-609038] p 3828 N93-31176
TITANIUM ALLOYS
Use of titanium castings without a casting factor
[AD-A264414] p 3705 N93-31192
AGARD Engine Disc Cooperative Test Programme
[AGARD-R-766-ADD] p 3681 N93-31741
Fractographic investigation of IMI 685 crack propagation specimens for SMP SC33 p 3681 N93-31743
Material characterization and fractographic examination of Ti-17 fatigue crack growth specimens for SMP SC33
p 3681 N93-31744
Low cycle fatigue behaviour of titanium disc alloys
p 3682 N93-31745
Fatigue crack growth results for Ti-6Al-4V, IMI 685, and Ti-17 p 3682 N93-31746
Crack growth prediction results p 3682 N93-31748
Low cycle fatigue behaviour of titanium disc alloys
[NLR-TP-91346-U] p 3683 N93-32372
TITANIUM COMPOUNDS
HREM study of crystallography of titanium and titanium hydride thin films
[DE93-609038] p 3828 N93-31176
TITANIUM NITRIDES
Carbon diffusion in uncoated and titanium nitride coated iron substrates during microwave plasma assisted chemical vapor deposition of diamond
[DE93-608934] p 3708 N93-31174
TITRATION
The effect of alkyl substituents on the macrocycle ring on enantiomeric recognition by chiral pyridino-18-crown-6 for 1-naphthylethylamine
[AD-A265513] p 3704 N93-31918
TOBACCO
Survey of smoking habits in the Spanish Air Force
p 3781 N93-32262
TOKAMAK DEVICES
Tokamak plasma shape identification based on the boundary integral equations
[DE93-715383] p 3825 N93-31097
TOLERANCES (MECHANICS)
Structural dynamics: Probabilistic structural analysis methods. Program overview p 3694 N93-31562
TOPOGRAPHY
Access and content of the EDBS topographic-cartographic information system (ATKIS)
p 3745 N93-31267
Code vector density in topographic mappings
[RSRE-MEMO-4669] p 3746 N93-31611
Radar studies of the West Antarctic ice streams
p 3760 N93-31891
Airborne gravity and other geophysical techniques for understanding the lithosphere beneath the West Antarctic Ice Sheet p 3761 N93-31894
TOPOLOGY
Gravitation of global topological defects
p 3757 N93-31130
Cut locus and medial axis in global shape interrogation and representation
[PB93-189884] p 3786 N93-31199
Geographical and topographical data from satellite images used in developing a digital road topology database p 3745 N93-31266
Three-neutrino oscillations in matter and topological phases
[DE93-608386] p 3813 N93-31290
Structurally stable quadratic systems without limit cycles
[REPT-92-58] p 3805 N93-31501
The crease structure of the Karush-Kuhn-Tucker set in parametric optimization
[REPT-92-62] p 3806 N93-31551
TORQUE SENSORS (ROBOTICS)
Characterisation and control of a flexible robot subject to torque ripple
[OUEL-1952/92] p 3734 N93-31156
TORSION
Axial and torsional fatigue behavior of a cobalt-base alloy p 3697 N93-31582
Torsional vestibulo-ocular reflex measurements for identifying otolith asymmetries possibly related to space motion sickness susceptibility
[NASA-CR-193304] p 3774 N93-32364
TORSIONAL VIBRATION
Sensitivity analysis of coupled bending and torsional vibrations in flexible robot arms
[MEMO-1088] p 3735 N93-31526
TOUGHNESS
Cycles in tough graphs: Updating the last four years
[MEMO-1091] p 3810 N93-32398
TOXIC HAZARDS
TSCA confidential business information security manual
[PB93-184844] p 3839 N93-31833
Applications analysis report: Silicate Technology Corporation's solidification/stabilization technology for organic and inorganic contaminants in soils
[PB93-172948] p 3715 N93-32408
Micro-organisms, cytotoxins and radioactive preparation: Risks at rescue operations in hospital environment
[FOA-A-40065-4.5] p 3772 N93-32423
TRACE ELEMENTS
Effects of hydrogen and electron diffusion on trace species diffusion in the solar atmosphere
p 3878 N93-31413
Source apportionment of air pollution in China: Extending the usefulness of receptor modeling by combining multivariate and chemical mass balance models
[PB93-185726] p 3756 N93-32188
TRACKING (POSITION)
A framework for spatio-temporal control in the tracking of visual contours
[OUEL-1961/92] p 3785 N93-31055
Experimental evaluation of an arrival time difference lightning positioning system
[KNMI-WR-92-01] p 3767 N93-31600
Parametric and combinatorial problems in constrained optimization
[AD-A265595] p 3792 N93-32096
TRACKING FILTERS
Tracking filters for precision Electronic Support Measures (ESM) systems
[AD-A264089] p 3719 N93-31085
Towards a new approach to autonomous navigation for a vehicle: A link between probability data association filtering and the evidence theory
[ONERA-NT-1990-11] p 3798 N93-31427
TRACKING PROBLEM
Estimation and control in discrete-time nonlinear systems p 3797 N93-31071
TRACKS
Maglev guideway route alignment and right-of-way requirements
[PB93-154854] p 3735 N93-31592
TRAINING ANALYSIS
Investigation of advanced technology for airway facilities maintenance training
[DOT/FAA/CT-TN92/24] p 3678 N93-32336
TRAINING SIMULATORS
Graphics simulation and training aids for advanced teleoperation p 3793 N93-32119
TRAJECTORIES
The effect of sensory input on trajectories generated by recurrent neural networks
[AD-A264501] p 3799 N93-32036
TRAJECTORY MEASUREMENT
Ground- and satellite-derived flight-path measurements as demonstrated in the AFES Avionics Flight Evaluation System (AFES) p 3677 N93-31281
On-board derived flight-path measurement as demonstrated by an ILS measurement system
p 3677 N93-31282
TRAJECTORY OPTIMIZATION
Real-time trajectory optimization on parallel processors
[NASA-CR-193303] p 3795 N93-31640
Variational Trajectory Optimization Tool Set: Technical description and user's manual
[NASA-TM-4442] p 3690 N93-32381
TRAJECTORY PLANNING
A theory of planar grasp
[OUEL-1958/92] p 3785 N93-31126
Path planning control p 3685 N93-31451
Flight evaluation of a computer aided low-altitude helicopter flight guidance system
[NASA-TM-103998] p 3678 N93-32225
TRANSCONDUCTANCE
DLTS and dynamic transconductance analysis of deep-submicron fully-depleted SOI MOSFETs
[AD-A264888] p 3721 N93-31984
TRANSDUCERS
Dynamic response of a transducer mounted at one end of an acoustical cavity
[DE93-012837] p 3816 N93-32301
TRANSFORMATIONS (MATHEMATICS)
Integration and implementation of the automated natural deduction in demonstrators using resolution
[ETN-93-94239] p 3803 N93-31208
TRANSIENT RESPONSE
Test measurements for quick analog digital converters for an x ray CCD camera
[ETN-93-94204] p 3728 N93-31119
Transient analysis for ground fault distance estimation in electrical distribution networks
[VTT-PUBS-115] p 3720 N93-31536
TRANSISTORS
R and D status report: RF vacuum microelectronics
[AD-A264381] p 3721 N93-32033
TRANSITION FLOW
Heat transfer measurements using infra-red thermography in rarefied flows
[RAE-TM-W-1] p 3724 N93-31336
Multiple flows in the solar transition region
p 3857 N93-31704
Reynolds number influences in aeronautics
[NASA-TM-107730] p 3673 N93-31732
Effects of an aft facing step on the surface of a laminar flow glider wing
[NASA-CR-193302] p 3673 N93-31855
Turbulence and transition modeling for high-speed flows
[NASA-CR-191473] p 3727 N93-32329
TRANSITION METALS
Fundamental studies of new high-energy permanent magnet materials
[DE93-014707] p 3815 N93-32291
TRANSITION TEMPERATURE
High temperature superconductivity: Concept, preparation and testing of high T(sub c) superconductor compounds and applications
[DE93-608696] p 3827 N93-31077
High temperature superconducting films and multilayers for electronics
[AD-A264410] p 3828 N93-31190
TRANSMISSION ELECTRON MICROSCOPY
Hierarchical textures in ferroelectric crystals
[DE93-608938] p 3827 N93-31175
HREM study of crystallography of titanium and titanium hydride thin films
[DE93-609038] p 3828 N93-31176
Electron-microscopic investigations of irradiated and naturally aged aluminum alloy
[DE93-606752] p 3706 N93-31660
TRANSMISSION LINES
Determination of the electrostatic Green's function for stratified media
[REPT-92-067] p 3716 N93-31607
Numerical analysis of the spectral domain of transmission lines in dielectric layers
[REPT-92-068] p 3716 N93-31608
Implementation of interconnect simulation tools in spice
[NASA-CR-193619] p 3792 N93-32239
TRANSMITTERS
Development of jitter measurement procedures for digital fiber optic modules
[AD-A265550] p 3824 N93-31915
Precipitation hardening of infrared transmitting ZnS ceramics
[AD-A265184] p 3710 N93-31993
TRANSONIC FLOW
TDLM: A Transonic Doublet Lattice Method for 3D potential unsteady transonic flow calculation
[DLR-FB-92-25] p 3671 N93-31171
Development of a method to predict transonic limit cycle oscillation characteristics of fighter aircraft
[NLR-TP-91359-U] p 3679 N93-32338
NLR inviscid transonic unsteady loads prediction methods in aeroelasticity
[NLR-TP-91410-U] p 3674 N93-32358
TRANSONIC WIND TUNNELS
A break-down of sting interference effects
[NLR-TP-91220-U] p 3684 N93-31042
A PC-based simulation of the National Transonic Facility's safety microprocessor
[NASA-TM-109003] p 3796 N93-32224
TRANSPARENCE
Research studies in electromagnetically induced transparency
[AD-A264303] p 3732 N93-31866

TRANSPORT AIRCRAFT
Longitudinal acceleration test of overhead luggage bins in a transport airframe section
[DOT/FAA/CT-92/9] p 3674 N93-31652
Engine exhaust characteristics evaluation in support of aircraft acoustic testing
[NASA-TM-104263] p 3682 N93-32220
Propulsion technology challenges for turn-of-the-century commercial aircraft
[NASA-TM-106192] p 3682 N93-32351
UK airmisses involving commercial air transport, September - December 1991
[ETN-93-93930] p 3674 N93-32409
TRANSPORT PROPERTIES
Quantum transport
[AD-A264935] p 3832 N93-32072
TRANSPORT THEORY
Relativistic transport theory
[KVI-952] p 3830 N93-31121
Experiences with different parallel programming paradigms for Monte Carlo particle transport leads to a portable toolkit for parallel Monte Carlo
[DE93-009061] p 3796 N93-31986
Localization and transport in random media
[AD-A264640] p 3726 N93-32014
TRANSVERSE ACCELERATION
Recent acceleration of Thwaites Glacier
p 3761 N93-31893
TRAPPED PARTICLES
Electron trapping optical data storage system and applications p 3730 N93-31975
Investigation of trap emission kinetics MOS capacitors using a pump-probe charge integrating technique
[AD-A265198] p 3721 N93-31994
TRAPPING
Electron trapping optical data storage system and applications p 3730 N93-31975
TRAVELING WAVES
Vibrational power transmission in curved beams. Part 1: Theory
[ISVR-TR-208] p 3742 N93-32340
TREES (MATHEMATICS)
A soft-competitive splitting rule for adaptive tree-structured neural networks
[AD-A264936] p 3799 N93-32073
TRELLIS CODING
Trellis coded modulation applied to orthogonal signals
[AD-A265232] p 3717 N93-32060
TREND ANALYSIS
SeaWiFS technical report series. Volume 10: Modeling of the SeaWiFS solar and lunar observations
[NASA-TM-104566-VOL-10] p 3770 N93-31859
TRIANGULATION
European Road Database: Activities within the ATKIS
p 3744 N93-31257
TRIATOMIC MOLECULES
The three-body problem in the ground-state representation
[DE93-608164] p 3803 N93-31289
TRIBOLOGY
Fast Fourier Transform analysis of computer-acquired friction data
[DE93-010337] p 3736 N93-32179
Tribological characteristics of perfluoropolyether liquid lubricants under sliding conditions in high vacuum
[NASA-TM-106257] p 3711 N93-32352
TRIMETHYL COMPOUNDS
Laser-assisted chemical vapor deposition of InN on Si(100)
[AD-A264266] p 3731 N93-31095
Improved gallium nitride and aluminum nitride electronic materials
[AD-A264570] p 3710 N93-32010
TROPICAL METEOROLOGY
Tropical cyclone forecasters reference guide, No. 3: Tropical cyclone formation
[AD-A265216] p 3768 N93-32005
TROPICAL REGIONS
Advances in dynamical predictions and modelling of tropical cyclone motion
[AD-A264500] p 3767 N93-31195
Hydrographic observations in the western tropical and subtropical North Atlantic Ocean: Atlantic Climate Change Program (ACCP) and Western Tropical Atlantic Experiment (WESTRAX) during 1991
[PB93-184778] p 3770 N93-31832
Central Africa: Global climate change and development
[PB93-179612] p 3768 N93-31871
Thermodynamic structure of subsidence inversions in the Atlantic subtropical anticyclone regime
[AD-A265406] p 3768 N93-32043
TROPICAL STORMS
Advances in dynamical predictions and modelling of tropical cyclone motion
[AD-A264500] p 3767 N93-31195
Tropical cyclone forecasters reference guide, No. 3: Tropical cyclone formation
[AD-A265216] p 3768 N93-32005
TROPOSPHERE
Aerosol optical properties of the free troposphere
[AD-A265795] p 3758 N93-31803
TUBE HEAT EXCHANGERS
Enhancement of single phase forced convection heat transfer in tubes and ducts using tangential flow injection
[PB93-189975] p 3723 N93-31210
TUNABLE LASERS
Research studies in electromagnetically induced transparency
[AD-A264303] p 3732 N93-31866
Infrared multiple photon dissociation spectra of gaseous ions
[AD-A264378] p 3821 N93-32032
TUNGSTEN
A model for predicting high-temperature fatigue failure of a W/Cu composite p 3696 N93-31579
Single crystal tungsten kinetic energy penetrators
[DE93-012570] p 3706 N93-32296
TUNGSTEN ALLOYS
The development of a tungsten heavy alloy that fails by an adiabatic shear mechanism, phase 1
[AD-A265867] p 3707 N93-32318
TUNING
Localization of aeroelastic modes in mistuned high-energy turbines p 3697 N93-31586
TURBINE BLADES
Progress in the measurement of SSME turbine heat flux with plug-type sensors p 3692 N93-31553
Thin film heat flux sensor for Space Shuttle Main Engine turbine environment p 3693 N93-31554
Thin film thermocouples for high temperature turbine application p 3693 N93-31555
Three-dimensional flow calculations inside SSME GGGT first stage blade rows p 3697 N93-31585
Localization of aeroelastic modes in mistuned high-energy turbines p 3697 N93-31586
Measurements and computational analysis of heat transfer and flow in a simulated turbine blade internal cooling passage
[NASA-TM-106189] p 3725 N93-31647
TURBINE PUMPS
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-10064] p 3692 N93-31552
Progress in the measurement of SSME turbine heat flux with plug-type sensors p 3692 N93-31553
Thin film heat flux sensor for Space Shuttle Main Engine turbine environment p 3693 N93-31554
Thin film thermocouples for high temperature turbine application p 3693 N93-31555
Three-dimensional analysis of the Pratt and Whitney alternate design SSME fuel turbine
p 3697 N93-31584
Three-dimensional flow calculations inside SSME GGGT first stage blade rows p 3697 N93-31585
Localization of aeroelastic modes in mistuned high-energy turbines p 3697 N93-31586
Heat transfer and pressure measurements for the SSME fuel turbine p 3698 N93-31587
TURBOFANS
Propulsion technology challenges for turn-of-the-century commercial aircraft
[NASA-TM-106192] p 3682 N93-32351
TURBOMACHINERY
An incompressible axisymmetric through-flow calculation procedure for design and off-design analysis of turbomachinery
[AD-A264933] p 3726 N93-32071
TURBULENCE
U.S. National weather experiment STORM-FEST 1992: Wave and turbulence in frontal zones
[AD-A264294] p 3766 N93-31182
Study of ISM turbulence using radiointerferometers (new method) p 3847 N93-31767
TURBULENCE MODELS
Overview of aerothermodynamic loads definition study
p 3697 N93-31583
Turbulence and transition modeling for high-speed flows
[NASA-CR-191473] p 3727 N93-32329
TURBULENT BOUNDARY LAYER
Localization and transport in random media
[AD-A264640] p 3726 N93-32014
Turbulence and transition modeling for high-speed flows
[NASA-CR-191473] p 3727 N93-32329
TURBULENT COMBUSTION
Turbulence measurement in a reacting and non-reacting shear layer at a high subsonic Mach number
[NASA-TM-106186] p 3673 N93-31839
TURBULENT FLOW
GARTEUR 3D sheer layer experiment
[FFA-TN-1992-26] p 3671 N93-31052
Turbulence measurement in a reacting and non-reacting shear layer at a high subsonic Mach number
[NASA-TM-106186] p 3673 N93-31839
Numerical simulation of the flow in a 1:57-scale axisymmetric model of a large blast simulator
[AD-A265551] p 3685 N93-31916
A rapid-distortion-theory turbulence model for developed unsteady wall-bounded flow
[NASA-TM-106249] p 3727 N93-32199
A critical comparison of several low Reynolds number k-epsilon turbulence models for flow over a backward facing step
[NASA-TM-106173] p 3809 N93-32200
Turbulence and transition modeling for high-speed flows
[NASA-CR-191473] p 3727 N93-32329
The prediction of noise from co-axial jets
[ISVR-TR-215] p 3817 N93-32339
TURBULENT MIXING
The parameterization of vertical turbulent mixing processes in a general circulation model of the tropical Pacific
[KNMI-WR-92-03] p 3758 N93-31594
TURING MACHINES
Tapes, queues and communicating automata in DIAC
[REPT-92-94] p 3789 N93-31631
TWO DIMENSIONAL FLOW
Orographically forced internal-wave instability
[ISBN-0-315-73891-X] p 3757 N93-31106
TWO DIMENSIONAL MODELS
Modal synthesis technique used in shallow doublewall
[FFA-TN-1992-29] p 3722 N93-31053
Modeling studies of ice-ocean dynamics and thermodynamics
[AD-A264084] p 3769 N93-31082
Quasi-parallel shock re-formation: Two-dimensional simulations p 3826 N93-31682
Relaxational dynamics and precursor domains in the non-linear shell model
[DE92-642676] p 3820 N93-31805
TWO STAGE TURBINES
Three-dimensional analysis of the Pratt and Whitney alternate design SSME fuel turbine
p 3697 N93-31584

U

U.S.S.R.
The applicability and availability of Former Soviet Union (FSU) space-related capabilities and facilities to energy-related space activities of Department of Energy, Department of Defense and National Aeronautics and Space Administration
[DE93-010286] p 3686 N93-32178
ULTRASONIC TESTS
Performance of an impact loaded sandwich plate
[VTT-JULK-767] p 3702 N93-32388
ULTRAVIOLET ASTRONOMY
Spectral classification with the International Ultraviolet Explorer: An atlas of B-type spectra
[NASA-RP-1312] p 3861 N93-31737
Ultraviolet imaging interferometry
p 3844 N93-31752
Summary of the splinter session on optical and UV science p 3848 N93-31773
UV interferometry of hot stars p 3848 N93-31774
ULTRAVIOLET LASERS
Research studies in electromagnetically induced transparency
[AD-A264303] p 3732 N93-31866
ULTRAVIOLET RADIATION
Quiet and active solar structures as observed at the bottom of the transition region p 3874 N93-31382
ULTRAVIOLET SPECTRA
Multiple flows in the solar transition region
p 3857 N93-31704
Interferometry at the vacuum ultra-violet limit
p 3850 N93-31785
ULTRAVIOLET SPECTROMETERS
SUMER: Temperatures, densities, and velocities in the outer solar atmosphere p 3867 N93-31346
The coronal diagnostic spectrometer for the Solar and Heliospheric Observatory p 3868 N93-31347
UVCS: The ultraviolet coronograph spectrometer for SOHO p 3868 N93-31349
Observations of the solar corona with a high resolution EUV imaging spectrograph p 3875 N93-31390
CELIAS: Charge, Element and Isotope Analysis System for the SOHO mission p 3860 N93-31725
Interferometry at the vacuum ultra-violet limit
p 3850 N93-31785

ULTRAVIOLET SPECTROPHOTOMETERS
Calibration of ORFEUS echelle spectrometer
[ETN-93-94201] p 3691 N93-31048
ULTRAVIOLET SPECTROSCOPY
Ultraviolet imaging interferometry
p 3844 N93-31752
ULTRAVIOLET TELESCOPES
Solar corona synoptic observations from SOHO with an extreme ultraviolet imaging telescope
p 3868 N93-31348
The SUN/SIMURIS interferometer
p 3845 N93-31759
ULYSSES MISSION
Solar wind abundances from Ulysses
p 3878 N93-31409
Plasma wave phenomena observed at interplanetary shocks by the Ulysses URAP experiment
p 3826 N93-31684
UNDERGROUND STORAGE
Micromachined chemical sensor with integrated microelectronics
[DE93-013761] p 3730 N93-32306
UNDERWATER ACOUSTICS
Near bottom data collection and data analysis
[AD-A265872] p 3771 N93-32172
UNDERWATER RESOURCES
Benthic study of the continental slope off Cape Hatteras, North Carolina, volume 2
[PB93-186070] p 3771 N93-32190
UNDERWATER VEHICLES
TeleOperator/telePresence System (TOPS) Concept Verification Model (CVM) development
p 3784 N93-32112
UNIQUENESS
Uniqueness of limit cycles in polynomial systems with algebraic invariants
[REPT-92-72] p 3805 N93-31505
UNIQUENESS THEOREM
Existence and uniqueness of limit cycles for a special system of differential equations on the plane
[REPT-92-63] p 3806 N93-31550
UNITED KINGDOM
Co-ordinated data handling for the UK participants in the Cluster mission p 3843 N93-31713
Reportable accidents to UK registered aircraft, and to foreign registered aircraft in UK airspace, 1990
[CAP-600] p 3674 N93-31730
UNITED STATES
Helium resources of the United States, 1991
[PB93-189652] p 3743 N93-31116
Foreign participation in US Academic science and engineering: 1991
[PB93-186583] p 3833 N93-31328
Relationships between ozone precursor levels and response to emissions reductions: Analysis of regional oxidant model results for the northeastern United States
[PB93-186294] p 3756 N93-32189
Internation aircraft operator information system
[DOT/FAA/CT-93/4] p 3671 N93-32232
UNITS OF MEASUREMENT
Metrication: An economic wake-up call for US industry
[PB93-188969] p 3714 N93-31109
UNIVERSE
Sterile neutrinos as dark matter
[DE93-012533] p 3822 N93-32294
UNIVERSITIES
Foreign participation in US Academic science and engineering: 1991
[PB93-186583] p 3833 N93-31328
UNIVERSITY PROGRAM
The 1992 Langley Aerospace Research Summer Scholars (LARSS) program
[NASA-CR-193371] p 3833 N93-32229
UNIX (OPERATING SYSTEM)
Automating multilingual communication
p 3837 N93-31219
UNMANNED SPACECRAFT
NASA's progress in nuclear electric propulsion technology
[NASA-TM-106272] p 3698 N93-31858
UNSTEADY AERODYNAMICS
The influence of variable flow velocity on unsteady airfoil behavior
[DLR-FB-92-22] p 3672 N93-31320
UNSTEADY FLOW
TDLM: A Transonic Doublet Lattice Method for 3D potential unsteady transonic flow calculation
[DLR-FB-92-25] p 3671 N93-31171
Calculations on unsteady type 4 interaction at Mach 8
[AD-A265214] p 3673 N93-32004
Modeling and inference for transient tracers on oceanic flow
[AD-A265428] p 3770 N93-32037
A rapid-distortion-theory turbulence model for developed unsteady wall-bounded flow
[NASA-TM-106249] p 3727 N93-32199
NLR inviscid transonic unsteady loads prediction methods in aeroelasticity
[NLR-TP-91410-U] p 3674 N93-32358
UNSWEPT WINGS
Integrated structural design, vibration control, and aeroelastic tailoring by multiobjective optimization
p 3739 N93-31137
UPPER ATMOSPHERE
U.S. National weather experiment STORM-FEST 1992: Wave and turbulence in frontal zones
[AD-A264294] p 3766 N93-31182
Determination of design and operation parameters for upper atmospheric research instrumentation to yield optimum resolution with deconvolution, appendix 3
[NASA-CR-192835] p 3766 N93-32231
UPPER IONOSPHERE
Investigation of fine-scale aurora with the Freja electric field instrument p 3860 N93-31719
URANIUM
The kinetics of the hydriding of uranium metal 2
[DE93-004766] p 3704 N93-31184
On the quantitative interpretation of uranium series disequilibria
[VTT-TIED-1404] p 3821 N93-31863
URANIUM ALLOYS
The development of a tungsten heavy alloy that fails by an adiabatic shear mechanism, phase 1
[AD-A265867] p 3707 N93-32318
URANIUM COMPOUNDS
Applications of optical fiber to remote laser fluorescence analysis
[DE93-607553] p 3732 N93-31826
URANUS (PLANET)
Analysis of Uranian radio emissions, Uranus Data Analysis Program (UDAP)
[NASA-CR-193524] p 3882 N93-32222
URBAN DEVELOPMENT
Towards a sustainable urban environment: The Rio de Janeiro study
[PB93-187557] p 3751 N93-31330
URBAN PLANNING
Towards a sustainable urban environment: The Rio de Janeiro study
[PB93-187557] p 3751 N93-31330
URBAN RESEARCH
Towards a sustainable urban environment: The Rio de Janeiro study
[PB93-187557] p 3751 N93-31330
URINE
Applications of optical fiber to remote laser fluorescence analysis
[DE93-607553] p 3732 N93-31826
Microbiological test results of the environmental control and life support systems vapors compression distillation subsystem recycle tank components following various pretreatment protocols
[NASA-CR-192570] p 3772 N93-32354
Microbiological and corrosion analysis of three urine pretreatment regimes with titanium 6A1-4V
[NASA-CR-192575] p 3783 N93-32356
USER MANUALS (COMPUTER PROGRAMS)
Operation of the helicopter antenna radiation prediction code
[NASA-CR-193259] p 3715 N93-31110
COBOL Compiler Validation System (CCVS 85), user guide, version 4.2
[PB93-163178] p 3785 N93-31112
WBNFLOW: Multi-grid/multi-block potential solver for compressible flow. User's guide
[FFA-TN-1992-43] p 3723 N93-31146
Software to model AXAF image quality
[NASA-CR-192574] p 3789 N93-31637
Online guided tour of the Cleanup Information Bulletin Board System. (CLU-IN: Cleanup Information Bulletin Board)
[PB93-193704] p 3752 N93-31818
Venari/ML interfaces and examples
[AD-A265416] p 3841 N93-32048
Orbit Analysis Tools Software user's manual, version 1
[AD-A265012] p 3686 N93-32081
Variational Trajectory Optimization Tool Set: Technical description and user's manual
[NASA-TM-4442] p 3690 N93-32381
USER REQUIREMENTS
Distributed data systems in space physics
p 3859 N93-31715
The computer integrated documentation project: A merge of hypermedia and AI techniques
p 3801 N93-32148
Information for the user in design of intelligent systems p 3801 N93-32149
ARIES: Acquisition of Requirements and Incremental Evolution of Specifications p 3794 N93-32157
Blocking probabilities in a loss system with arrivals in geometrically distributed batches and heterogeneous service requirements
[MEMO-1074] p 3812 N93-32392

V

VACANCIES (CRYSTAL DEFECTS)
The thermodynamic and structural contributions to the vacancy formation energies in hot rare gas solids
[DE93-604742] p 3827 N93-31086
Numerical evidence for two types of localized states in a two-dimensional disordered lattice
[DE92-642677] p 3827 N93-31159
VACUUM
R and D status report: RF vacuum microelectronics
[AD-A264381] p 3721 N93-32033
Progress toward atomic layer epitaxy of diamond using radical chemistry
[AD-A265409] p 3829 N93-32045
VACUUM APPARATUS
Turntable mechanism
[NASA-CASE-MFS-28522-1] p 3734 N93-31313
VACUUM CHAMBERS
Optically powered photomultiplier tube
[AD-D015735] p 3722 N93-32207
VALENCE
Laser-assisted chemical vapor deposition of InN on Si(100)
[AD-A264266] p 3731 N93-31095
VALIDITY
Phases of the project development and examination methodologies p 3775 N93-31231
VALLEYS
Land subsidence and problems affecting land use at Edwards Air Force Base and vicinity, California, 1990
[PB93-182236] p 3765 N93-32191
VALVES
Liquid-crystal heat valve controlled with multiple electrode pairs
[AD-D015739] p 3830 N93-32211
VANADIUM OXIDES
Thermal stability of lithiated vanadium oxide (LVO), gamma-lithium vanadium bronze (gamma-LiV2O5) and vanadium dioxide (VO2) thermal battery cathode materials
[RAE-TR-92047] p 3722 N93-32422
VANES
Advanced aircraft with thrust vector control
[MBB-FE-1-S-PUB-0504] p 3678 N93-31043
Penn State axial flow turbine facility: Performance and nozzle flow field p 3698 N93-31588
VAPOR DEPOSITION
Laser-assisted chemical vapor deposition of InN on Si(100)
[AD-A264266] p 3731 N93-31095
Carbon diffusion in uncoated and titanium nitride coated iron substrates during microwave plasma assisted chemical vapor deposition of diamond
[DE93-608934] p 3708 N93-31174
Thermodynamic analysis of processes proceeding on (111) faces of diamond during chemical vapour deposition
[DE93-609039] p 3708 N93-31177
SiC fiber-reinforced Celsian glass-ceramic matrix composite
[NASA-CASE-LEW-15264-1] p 3700 N93-31293
Method of producing a ceramic fiber-reinforced glass-ceramic matrix composite
[NASA-CASE-LEW-15264-2] p 3700 N93-31299
A study on the development of high T(sub c) superconducting materials
[DE93-606394] p 3720 N93-31825
Infrared spectroscopy of hydrogen and water on diamond (100)
[AD-A265531] p 3704 N93-31920
Investigation of diamond homoepitaxy by in situ Fizeau interferometry: The role of oxygen
[AD-A265544] p 3829 N93-31921
An electron cyclotron resonance plasma process for InP passivation
[AD-A265036] p 3826 N93-31998
Large-area, triple-junction a-Si alloy production scale-up
[DE93-010007] p 3750 N93-32177
Investigation of PACVD protective coating processes using advanced diagnostics techniques
[DE93-013978] p 3711 N93-32307
VAPOR PHASES
Micromachined chemical sensor with integrated microelectronics
[DE93-013761] p 3730 N93-32306
VAPORIZERS
Study on laser atomic spectroscopy
[DE93-606193] p 3703 N93-31824

VARIABILITY
Use of titanium castings without a casting factor
[AD-A264414] p 3705 N93-31192
Variability of temperature and salinity in the Middle Atlantic Bight and Gulf of Maine
[PB93-174019] p 3769 N93-31591
Statistics of mass production
[AD-A264365] p 3715 N93-31867
Recent changes of weather patterns in North America
[DE93-013982] p 3769 N93-32289

VARIABLE
Undecidability of modal and intermediate first-order logics with two individual variables
[ML-92-06] p 3804 N93-31480

VARIABLE STARS
P Cyg envelope and prospects of interferometric observations p 3848 N93-31777

VARIANCE (STATISTICS)
Variability of temperature and salinity in the Middle Atlantic Bight and Gulf of Maine
[PB93-174019] p 3769 N93-31591

VARIATIONAL PRINCIPLES
Complex Kohn variational principle for the solution of Lippmann-Schwinger equations
[DE93-609885] p 3814 N93-31910

VECTOR QUANTIZATION
Code vector density in topographic mappings
[RSRE-MEMO-4669] p 3746 N93-31611

VECTOR SPACES
Normal forms of invariant vector fields under a finite group action
[DE93-604134] p 3813 N93-31102
Multiparametric quantum symplectic phase space
[DE93-604081] p 3802 N93-31162
Uniqueness of limit cycles in polynomial systems with algebraic invariants
[REPT-92-72] p 3805 N93-31505
On global bifurcations caused by the unfolding of a homoclinic orbit
[W-9221] p 3806 N93-31524

VECTORS (MATHEMATICS)
On a class of geometric vector optimization problems
[REPT-92-51] p 3804 N93-31485

VEGETATION
Monitoring vegetation greenness with satellite data
[PB93-190882] p 3744 N93-31213

VEGETATION GROWTH
Vegetation mapping for environment management and monitoring
[ETN-93-93466] p 3747 N93-32342

VEGETATIVE INDEX
Monitoring vegetation greenness with satellite data
[PB93-190882] p 3744 N93-31213
Vegetation mapping for environment management and monitoring
[ETN-93-93466] p 3747 N93-32342

VELOCITY DISTRIBUTION
Speeds and accelerations of coronal mass ejections p 3871 N93-31368
Mass motion of a heated plasma blob in a coronal loop p 3874 N93-31384
Underneath coronal loops: MSDP observations coordinated with SERTS 4 and NiXT flights p 3876 N93-31397
Contribution to the experimental and theoretical study of vortex breakdown
[ONERA-NT-1990-12] p 3724 N93-31477
Surface velocity fields of Ice Streams D and E derived from repeat satellite imagery p 3760 N93-31890
The role of the margins in ice stream dynamics p 3761 N93-31896
Evolution of area-averaged vertical velocity in the convective region of a midlatitude squall line
[AD-A265333] p 3768 N93-32063

VELOCITY MEASUREMENT
The solar oscillations investigation: Michelson Doppler imager p 3867 N93-31345
Speeds and accelerations of coronal mass ejections p 3871 N93-31368
Contribution to the experimental and theoretical study of vortex breakdown
[ONERA-NT-1990-12] p 3724 N93-31477
The shot continuation operator
[REPT-92-065] p 3758 N93-31606
A new method for measuring the speed of the bow shock p 3854 N93-31687
Turbulence measurement in a reacting and non-reacting shear layer at a high subsonic Mach number
[NASA-TM-106186] p 3673 N93-31839
Velocities of Thwaites and Land glaciers p 3760 N93-31885
Condition of the Ross Ice Shelf derived from AVHRR imagery p 3760 N93-31886
Surface velocity fields of Ice Streams D and E derived from repeat satellite imagery p 3760 N93-31890
Recent acceleration of Thwaites Glacier p 3761 N93-31893
Wind profiling in a cloudy convective atmospheric boundary layer over land
[AD-A265422] p 3768 N93-32051

VENTING
In-situ bioventing: Two US EPA and Air Force sponsored field studies
[PB93-194231] p 3754 N93-32089

VERTICAL DISTRIBUTION
Wind profiling in a cloudy convective atmospheric boundary layer over land
[AD-A265422] p 3768 N93-32051

VERY LARGE ARRAY (VLA)
Very Large Array (VLA) observations of coronal loops p 3879 N93-31419

VERY LARGE SCALE INTEGRATION
Analysis of fault tolerance in artificial neural networks
[REPT-92-048] p 3797 N93-31255

VERY LONG BASE INTERFEROMETRY
Radiointerferometric observations for estimation of pole motion by using long north-south reference axes
[SER-C-368] p 3746 N93-31339
High resolution imaging from the ground using a satellite-borne laser guide star p 3849 N93-31781
Process control and recovery in the Link Monitor and Control Operator Assistant p 3719 N93-32145

VERY LOW FREQUENCIES
Near bottom data collection and data analysis
[AD-A265872] p 3771 N93-32172

VIBRATION
Non-standard representations of the space-time groups and their applications to the dynamical theory of elementary particles
[DE93-608203] p 3818 N93-31240
The development of a ring model for the study of tire in-plane dynamics
[MEMT-20] p 3734 N93-31508
Development of jitter measurement procedures for digital fiber optic modules
[AD-A265550] p 3824 N93-31915
Vibration analysis in turbomachines p 3683 N93-32274

VIBRATION DAMPING
Integrated structural design, vibration control, and aeroelastic tailoring by multiobjective optimization p 3739 N93-31137
Active damping in a flexible manipulator p 3689 N93-31452
Damping mechanisms in chemically vapor deposited SiC fibers
[NASA-TM-109236] p 3701 N93-32219
Design and application of Active Magnetic Bearings (AMB) for vibration control p 3738 N93-32279

VIBRATION EFFECTS
Transmission of vibration through the human body to the head: A summary of experimental data
[ISVR-TR-218] p 3774 N93-32237

VIBRATION ISOLATORS
Vibration isolation p 3690 N93-31458

VIBRATION MEASUREMENT
Efficient fault diagnosis of helicopter gearboxes
[NASA-TM-106253] p 3735 N93-31846
Vibrational diagnostics of rotating machinery malfunctions p 3738 N93-32278

VIBRATION MODE
The development of a ring model for the study of tire in-plane dynamics
[MEMT-20] p 3734 N93-31508
Localization of aeroelastic modes in mistuned high-energy turbines p 3697 N93-31586
Vibration and Rotor Dynamics
[VKI-LS-1992-06] p 3741 N93-32270
Structural dynamic charactertistics of bladed assemblies p 3683 N93-32273
One lateral mode isotropic rotor response to nonsynchronous excitation p 3738 N93-32276
Vibrational diagnostics of rotating machinery malfunctions p 3738 N93-32278
Design and application of Active Magnetic Bearings (AMB) for vibration control p 3738 N93-32279

VIBRATION TESTS
Damping mechanisms in chemically vapor deposited SiC fibers
[NASA-TM-109236] p 3701 N93-32219

VIBRATIONAL SPECTRA
Vibrational overtone spectroscopy of cyclic amines: Pyridine and related compounds
[AD-A265524] p 3704 N93-31919

VIBRATORY LOADS
Vibrational power transmission in curved beams. Part 1: Theory
[ISVR-TR-208] p 3742 N93-32340

VIDEO COMMUNICATION
Newly available technologies present expanding opportunities for scientific and technical information exchange p 3837 N93-31217
Video conferencing made easy
[DE93-010798] p 3718 N93-32283

VIDEO DATA
On board image processing for telescience support
[NLR-TP-91213-U] p 3823 N93-31056

VIDEO EQUIPMENT
The redwood project: An overview p 3841 N93-31979
Remote driving with reduced bandwidth communication p 3719 N93-32114

VIKING LANDER SPACECRAFT
Viking observations of electric fields p 3858 N93-31712

VIKING MARS PROGRAM
Using the Viking biology experimental results to obtain chemical information about Martian regolith p 3865 N93-31955

VIRTUAL REALITY
A preliminary empirical evaluation of virtual reality as an instructional medium for visual-spatial tasks p 3784 N93-32151

VISCOSITY
Viscosities of molten slags
[NPL-DMM(A)-55] p 3705 N93-31321
Materials compatibility and lubricants research on CFC-refrigerant substitutes
[DE93-014770] p 3711 N93-32292
Solubility, viscosity and density of refrigerant/lubricant mixtures
[DE93-014771] p 3711 N93-32293

VISCOUS DAMPING
Basic structural dynamics p 3741 N93-32271

VISCOUS FLOW
Three-dimensional analysis of the Pratt and Whitney alternate design SSME fuel turbine p 3697 N93-31584
Reynolds number influences in aeronautics
[NASA-TM-107730] p 3673 N93-31732
Numerical simulation of the flow in a 1:57-scale axisymmetric model of a large blast simulator
[AD-A265551] p 3685 N93-31916
Calculations on unsteady type 4 interaction at Mach 8
[AD-A265214] p 3673 N93-32004

VISIBILITY
Preliminary evaluation of aviation-impact variables derived from numerical models
[PB93-190197] p 3767 N93-31202

VISION
The test memorization of symbols and numbers: A computer generated test for visual sensitivity p 3775 N93-31233

VISUAL PERCEPTION
Computing with neural maps: Application to perceptual and cognitive function
[AD-A264092] p 3743 N93-31060
The aircraft position tests: A computer generated process for acquisition of spatial orientation capability p 3776 N93-31236

VISUAL TASKS
A preliminary empirical evaluation of virtual reality as an instructional medium for visual-spatial tasks p 3784 N93-32151

VITERBI DECODERS
Trellis coded modulation applied to orthogonal signals
[AD-A265232] p 3717 N93-32060

VOICE COMMUNICATION
Newly available technologies present expanding opportunities for scientific and technical information exchange p 3837 N93-31217
The clearance test: A computer generated process for acquisition of auditive short term sensitivity p 3776 N93-31234

VOLCANOES
Chemical transport during formation and alteration of Martian impact and volcanic deposits p 3865 N93-31953

VOLCANOLOGY
Aerogeophysical evidence for active volcanism beneath the West Antarctic Ice Sheet p 3761 N93-31895
Effect of subglacial volcanism on changes in the West Antarctic Ice Sheet p 3762 N93-31901
MSATT Workshop on Chemical Weathering on Mars
[NASA-CR-193209] p 3861 N93-31933
Implications for volcanogenic volatile release on the weathering of Mars p 3862 N93-31939
The application of remotely sensed data to studies of volcanism within the Galapagos Islands p 3747 N93-32326

VOLTAGE REGULATORS
Protection and regulation on direct-direct chopping converters
[CNES-NT-129] p 3719 N93-31475

VORTEX BREAKDOWN
Contribution to the experimental and theoretical study of vortex breakdown
[ONERA-NT-1990-12] p 3724 N93-31477
VORTEX GENERATORS
Streamwise vorticity generation and mixing enhancement in free jets by delta-tabs
[NASA-TM-106235] p 3672 N93-31648
VORTEX SHEETS
Localization and transport in random media
[AD-A264640] p 3726 N93-32014
VORTICES
Eddy vortices produced by nonlinear reflection of a gravity wave at a critical level p 3757 N93-31155
Advances in dynamical predictions and modelling of tropical cyclone motion
[AD-A264500] p 3767 N93-31195
Streamwise vorticity generation and mixing enhancement in free jets by delta-tabs
[NASA-TM-106235] p 3672 N93-31648
An acoustic scattering code
[AD-A265863] p 3816 N93-32316

W

WAKES
The interaction of a moving spacecraft with the ionosphere: Current collection and wake structure
p 3688 N93-31157
Penn State axial flow turbine facility: Performance and nozzle flow field p 3698 N93-31588
WALL FLOW
Numerical simulations of three-dimensional laminar flow over a backward facing step; flow near side walls
[NASA-TM-106248] p 3723 N93-31147
WALL TEMPERATURE
Study of wall heat transfer from a high temperature dissociated hydrogen impinging jet
[DE92-017845] p 3698 N93-32184
WALLS
Study of wall heat transfer from a high temperature dissociated hydrogen impinging jet
[DE92-017845] p 3698 N93-32184
Initial results from the NASA-Lewis wave rotor experiment
[NASA-TM-106148] p 3683 N93-32368
WARNING SYSTEMS
Experimental evaluation of an arrival time difference lightning positioning system
[KNMI-WR-92-01] p 3767 N93-31600
Intelligent security assessment for a mobile robot
[AD-A265003] p 3799 N93-32078
Fire protection for launch facilities using machine vision fire detection p 3687 N93-32113
Airborne derivation of microburst alerts from ground-based Terminal Doppler Weather Radar information: A flight evaluation
[NASA-TM-108990] p 3680 N93-32223
WASHERS (CLEANERS)
Performance of gas turbine compressor cleaners
[NLR-TP-91237-U] p 3681 N93-31111
WASTE DISPOSAL
Effects of low-level radioactive-waste disposal on water chemistry in the unsaturated zone at a site near Sheffield, Illinois, 1982-1984
[PB93-183051] p 3752 N93-31829
RCRA implementation plan, FY 1993
[PB93-176956] p 3752 N93-31877
The ecological balance of Swissair: An example of waste management p 3753 N93-31930
WASTE ENERGY UTILIZATION
Study survey on a high-efficiency environment harmony type energy cascade utilization system
[DE93-768469] p 3748 N93-31812
Projects within the Center for Advanced Materials
[PB93-175222] p 3699 N93-31870
WASTE HEAT
Study survey on a high-efficiency environment harmony type energy cascade utilization system
[DE93-768469] p 3748 N93-31812
Projects within the Center for Advanced Materials
[PB93-175222] p 3699 N93-31870
WASTE TREATMENT
Chemical dehalogenation treatment: Base-Catalyzed Decomposition Process (BCDP)
[PB93-182939] p 3751 N93-31432
RCRA implementation plan, FY 1993
[PB93-176956] p 3752 N93-31877
Geochemical, genetic, and physiological control of pollutant biodegradation
[AD-A264106] p 3753 N93-32027
Applications analysis report: Silicate Technology Corporation's solidification/stabilization technology for organic and inorganic contaminants in soils
[PB93-172948] p 3715 N93-32408
WASTE UTILIZATION
Session of alcohol and biomass energy technology
[DE93-768440] p 3749 N93-32056
WASTE WATER
Utilization of high energy electron beam in the treatment of drinking and waste water
[DE92-642335] p 3783 N93-32406
WATER
Infrared spectroscopy of hydrogen and water on diamond (100)
[AD-A265531] p 3704 N93-31920
Preliminary results of an experimental study of the interactions of basalt glass and a water vapor atmosphere: Implications for weathering on Mars
p 3864 N93-31948
Pressure induced topological phase transitions in membranes
[AD-A265212] p 3829 N93-32002
WATER FLOW
Preferential flow effects on chemical transport and retardation in soils
[PB93-190668] p 3723 N93-31204
Basal hydraulic conditions of Ice Stream B
p 3762 N93-31898
Modeling and inference for transient tracers on oceanic flow
[AD-A265428] p 3770 N93-32037
WATER HEATING
The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 2, part 1
[PB93-174787] p 3748 N93-31070
WATER MANAGEMENT
Remote sensing: A powerful aid for the analysis of problems in the north Holland Vechtstreek
[ETN-93-93468] p 3747 N93-32344
WATER POLLUTION
Three-dimensional modeling of pollutant transport in surface waters
[PB93-190627] p 3751 N93-31203
Effects of low-level radioactive-waste disposal on water chemistry in the unsaturated zone at a site near Sheffield, Illinois, 1982-1984
[PB93-183051] p 3752 N93-31829
Statistical and numerical methods in control and identification
[AD-A264676] p 3811 N93-32016
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 3: Appendices
[PB93-186088] p 3771 N93-32308
WATER PRESSURE
Basal hydraulic conditions of Ice Stream B
p 3762 N93-31898
WATER RECLAMATION
Microbiological test results of the environmental control and life support systems vapors compression distillation subsystem recycle tank components following various pretreatment protocols
[NASA-CR-192570] p 3772 N93-32354
Microbiological and corrosion analysis of three urine pretreatment regimes with titanium 6A1-4V
[NASA-CR-192575] p 3783 N93-32356
Optimization of 15 parameters influencing the long-term survival of bacteria in aquatic systems
[NASA-CR-192571] p 3772 N93-32365
WATER TREATMENT
Ion exchange polymers and method for making
[NASA-CASE-LEW-15576-1] p 3709 N93-31316
Utilization of high energy electron beam in the treatment of drinking and waste water
[DE92-642335] p 3783 N93-32406
WATER VAPOR
Preliminary results of an experimental study of the interactions of basalt glass and a water vapor atmosphere: Implications for weathering on Mars
p 3864 N93-31948
WATER WAVES
A continuation method for computing non-linear 3-D free surface flows
[DE93-008704] p 3727 N93-32175
A study of capillary and capillary-gravity wind waves: Their structures, distributions, and energy balances
p 3771 N93-32215
WAVE EQUATIONS
Resonance and near-resonance for a nonlinear wave equation
[REPT-92-92] p 3814 N93-31633
WAVE FRONT RECONSTRUCTION
Exploring the limits of adaptive wavefront compensation for ground based astronomical interferometers
p 3849 N93-31782
Wavefront reconstruction from three dimensional intensity measurements
[DE93-609881] p 3832 N93-31909
WAVE FRONTS
High resolution imaging from the ground using a satellite-borne laser guide star p 3849 N93-31781
WAVE FUNCTIONS
Calculations of wavefunctions and energies of electron system in Coulomb potential by variational method without a basis set
[DE93-608161] p 3819 N93-31286
Excitation of atomic hydrogen
[DE93-604639] p 3820 N93-31822
Scalar symmetry of the massless Dirac equation
[DE93-609921] p 3832 N93-31914
Helicity amplitudes for matter-coupled gravity
[DE93-609932] p 3832 N93-32025
WAVE INTERACTION
Nonlinear radiation of waves at combination frequencies due to radiation-surface wave interaction in plasmas
[DE93-608570] p 3825 N93-31667
Nonlinear interaction of Alfven waves in solar atmosphere p 3860 N93-31724
WAVE PROPAGATION
Heliospheric current sheet effects on the propagation of solar-generated shock waves p 3854 N93-31685
Diagnostics of magnetic substorms using satellite observations of magnetic pulsations
[AD-A264300] p 3764 N93-32084
WAVE REFLECTION
Eddy vortices produced by nonlinear reflection of a gravity wave at a critical level p 3757 N93-31155
WAVE SCATTERING
An efficient model for coupling structural vibrations with acoustic radiation
[NASA-CR-191452] p 3816 N93-31868
WAVEFORMS
On waveform multigrid method
[NASA-CR-191455] p 3808 N93-31843
Temperature dependence of the femtosecond optical response in doped high temperature superconductors
[DE93-009514] p 3829 N93-31988
A study of capillary and capillary-gravity wind waves: Their structures, distributions, and energy balances
p 3771 N93-32215
WAVELENGTHS
Observation of a coronal streamer at meter and decimeter wavelengths p 3872 N93-31373
WEAK INTERACTIONS (FIELD THEORY)
Radiative electroweak breaking and sparticle spectroscopy with tan(beta) is approximately equal to (m(sub t)) divided by (m(sub b))
[DE93-608399] p 3832 N93-31663
Lepton-quark families, cosmic strings and democratic mass matrix
[DE93-608263] p 3832 N93-31809
WEAPON SYSTEMS
Automated Assembly Center (AAC)
p 3686 N93-32123
WEAR
Zirconia ceramics and mechanical surface interactions
[ETN-93-94049] p 3709 N93-31541
Recording and wear characteristics of 4 and 8 mm helical scan tapes p 3730 N93-31969
Tribological characteristics of perfluoropolyether liquid lubricants under sliding conditions in high vacuum
[NASA-TM-106257] p 3711 N93-32352
WEAR TESTS
Recording and wear characteristics of 4 and 8 mm helical scan tapes p 3730 N93-31969
Fast Fourier Transform analysis of computer-acquired friction data
[DE93-010337] p 3736 N93-32179
WEATHER
U.S. National weather experiment STORM-FEST 1992: Wave and turbulence in frontal zones
[AD-A264294] p 3766 N93-31182
Recent changes of weather patterns in North America
[DE93-013982] p 3769 N93-32289
WEATHER FORECASTING
Advances in dynamical predictions and modelling of tropical cyclone motion
[AD-A264500] p 3767 N93-31195
The 3rd national heavy precipitation workshop
[PB93-166625] p 3767 N93-31329
Navy tactical applications guide, part 2, volume 8: Arctic-East Siberian/Chukchi/Beaufort Seas. Weather analysis and forecast applications
[AD-A265585] p 3768 N93-31922
Tropical cyclone forecasters reference guide, No. 3: Tropical cyclone formation
[AD-A265216] p 3768 N93-32005
WEATHERING
Surface degradation of polymeric materials
[NPL-DMM(A)-75] p 3709 N93-31323
MSATT Workshop on Chemical Weathering on Mars
[NASA-CR-193209] p 3861 N93-31933
The mineralogy and formation processes of Mars soil
p 3861 N93-31934

Effects of the chemical environment on the spectroscopic properties of clays: Applications for Mars p 3862 N93-31936
Dehydroxylated clay silicates on Mars: Riddles about the Martian regolith solved with ferrian saponites p 3862 N93-31937
The fate of iron on Mars: Mechanism of oxidation of basaltic minerals to ferric-bearing assemblages p 3862 N93-31938
Implications for volcanogenic volatile release on the weathering of Mars p 3862 N93-31939
On the weathering of Martian igneous rocks p 3862 N93-31941
Preliminary results of an experimental study of the interactions of basalt glass and a water vapor atmosphere: Implications for weathering on Mars p 3864 N93-31948
Composition of weakly altered Martian crust: Clues from imaging spectroscopy p 3865 N93-31952
Weathering processes implied from analysis of small Martian avalanche chutes p 3866 N93-31960
Geochemistry and setting of Martian weathering: The Lafayette meteorite p 3866 N93-31961

WEBBING
Web crippling of cold-formed steel members [ISBN-9-03-860122-0] p 3705 N93-31540

WEIGHT (MASS)
Surveillance schemes with applications to mass calibration [PB93-181881] p 3810 N93-31430

WEIGHT REDUCTION
Aircraft structures in 2000: A technological challenge? [MBB-LME-202-S-PUB-0485] p 3679 N93-31058

WELDED JOINTS
Deformation analysis of welded joints [ETN-93-94199] p 3739 N93-31057
Understanding heat and fluid flow in linear GTA welds [DE93-012958] p 3727 N93-32303

WELDING
Welding and metallurgy [DE93-010926] p 3735 N93-31790

WELDING MACHINES
Gas arc constriction for plasma arc welding [NASA-CASE-MFS-28844-1] p 3734 N93-31292

WELLS
Japan's Sunshine Project [DE93-768249] p 3749 N93-32053
Japan's Sunshine Project [DE93-768268] p 3749 N93-32054

WETLANDS
Florida's estuaries: A citizen's guide to coastal living and conservation [PB93-189330] p 3751 N93-31113
Remote sensing: A powerful aid for the analysis of problems in the north Holland Vechtstreek [ETN-93-93468] p 3747 N93-32344

WHEATSTONE BRIDGES
Feasibility of piezoresistive pressure sensors with polycrystalline silicon gauges [LAAS-92324] p 3728 N93-31127

WHISKER COMPOSITES
The development of SiC whisker fabrication technology for nuclear applications [DE93-605320] p 3710 N93-31828

WIND (METEOROLOGY)
Orographically forced internal-wave instability [ISBN-0-315-73891-X] p 3757 N93-31106
Eddy vortices produced by nonlinear reflection of a gravity wave at a critical level p 3757 N93-31155

WIND DIRECTION
Wind profiling in a cloudy convective atmospheric boundary layer over land [AD-A265422] p 3768 N93-32051

WIND EFFECTS
A numerical study of seasonal wind forcing effects on the California current system [AD-A264951] p 3770 N93-32075

WIND MEASUREMENT
Measurement uncertainties of the NCAR air motion systems [PB93-184208] p 3764 N93-32068

WIND PRESSURE
Energetic particles (greater than 34 KeV - 3.2 MeV) in the deep Martian magnetotail (X = 15.5 R(sub M)), modeling of the Martian bow shock and the influence of low solar wind pressure on Mars as an obstacle p 3855 N93-31691

WIND PROFILES
Wind profiling in a cloudy convective atmospheric boundary layer over land [AD-A265422] p 3768 N93-32051

WIND SHEAR
Numerical modelling of mesoscale atmospheric dispersion, volumes 1 and 2 p 3765 N93-32217
Airborne derivation of microburst alerts from ground-based Terminal Doppler Weather Radar information: A flight evaluation [NASA-TM-108990] p 3680 N93-32223

WIND TUNNEL CALIBRATION
A break-down of sting interference effects [NLR-TP-91220-U] p 3684 N93-31042

WIND TUNNEL MODELS
Supersonic aerodynamic characteristics of an advanced F-16 derivative aircraft configuration [NASA-TP-3355] p 3673 N93-31733

WIND TUNNEL TESTS
Experiments in the control of wing rock at high angle of attack using tangential leading edge blowing p 3683 N93-31068
Low-speed wind tunnel study of the direct side-force characteristics of a joined-wing airplane with an upper fin [DE93-767966] p 3672 N93-31189
Definition of an airfoil family for the EUROFAR rotor [DLR-FB-92-04] p 3679 N93-31197
Parametric studies of shock wave/boundary layer interactions over 2D compression corners at Mach 6 [VKI-TN-181] p 3672 N93-31538
Supersonic aerodynamic characteristics of an advanced F-16 derivative aircraft configuration [NASA-TP-3355] p 3673 N93-31733
Evaluation of candidate working fluid formulations for the electrothermal-chemical wind tunnel [NASA-CR-193366] p 3684 N93-31848
Effect of sound on boundary layer stability [NASA-CR-193367] p 3816 N93-32238
Active control of flow induced resonance in continuous corrugated tubes [AD-A265782] p 3727 N93-32310
Analytical and experimental investigations of the oblique detonation wave engine concept [NASA-TM-102839] p 3683 N93-32374

WIND TURBINES
High cycle fatigue of glass fibre reinforced epoxy materials for wind turbines [DLR-FB-92-17] p 3700 N93-31461

WIND VELOCITY
Wind profiling in a cloudy convective atmospheric boundary layer over land [AD-A265422] p 3768 N93-32051
Evolution of area-averaged vertical velocity in the convective region of a midlatitude squall line [AD-A265333] p 3768 N93-32063

WIND VELOCITY MEASUREMENT
Theory and application of a Radio-Acoustic Sounding System (RASS) [PB93-191252] p 3769 N93-31815

WINDPOWER UTILIZATION
Japan's Sunshine Project [DE93-768309] p 3748 N93-31811

WING NACELLE CONFIGURATIONS
WBNFLOW: Multi-grid/multi-block potential solver for compressible flow. User's guide [FFA-TN-1992-43] p 3723 N93-31146

WING PLANFORMS
Review of aerodynamic design in the Netherlands [NLR-TP-91260-U] p 3679 N93-31840

WINGS
Effects of an aft facing step on the surface of a laminar flow glider wing [NASA-CR-193302] p 3673 N93-31855

WINTER
Atmospheric dispersion of air pollutants in Umea (Sweden) [FOA-C-40300-4.5] p 3756 N93-32424

WIRE
Low aperture magnetic elements measurements [DE93-605897] p 3814 N93-31088
Electromagnetic response of a superconducting wire of finite length in a perpendicular applied AC magnetic field [MEMO-1087] p 3716 N93-31516
Progress in speckle-shift strain measurement p 3693 N93-31558

WOOD
Surface roughness measuring systems [VTT-TIED-1392] p 3748 N93-32420

WORKING FLUIDS
Evaluation of candidate working fluid formulations for the electrothermal-chemical wind tunnel [NASA-CR-193366] p 3684 N93-31848

WORKLOADS (PSYCHOPHYSIOLOGY)
Application and validation of workload assessment techniques [AD-A264575] p 3777 N93-32012

WORKSTATIONS
Numerical methods for inverse problems in three-dimensional geophysical modeling, phase 2 [PB93-181584] p 3758 N93-31872
Measurements over distributed high performance computing and storage systems p 3841 N93-31977
Data communication network at the ASRM facility [NASA-CR-193625] p 3686 N93-32236

WRIST
Prevention of cumulative trauma disorders [PB93-188332] p 3773 N93-31138

X

X RAY ANALYSIS
The determination of the thickness of the film materials by the PIXE method [DE93-607555] p 3823 N93-31090
Characterization of small noble metal electrodes by voltammetry and energy dispersive x ray analysis [AD-A265208] p 3721 N93-32001

X RAY APPARATUS
Software to model AXAF image quality [NASA-CR-192574] p 3789 N93-31637

X RAY ASTRONOMY
Periodic x ray flares of NGC 6814: Gravitational lensing of an accreting neutron star? [DE92-642586] p 3851 N93-31073

X RAY ASTROPHYSICS FACILITY
Software to model AXAF image quality [NASA-CR-192574] p 3789 N93-31637

X RAY DIFFRACTION
Measurement of the spatial coherence of a soft x ray laser [DE93-609404] p 3731 N93-31227
Pressure induced topological phase transitions in membranes [AD-A265212] p 3829 N93-32002

X RAY IMAGERY
Test measurements for quick analog digital converters for an x ray CCD camera [ETN-93-94204] p 3728 N93-31119
Observational tests of coronal heating models p 3877 N93-31403
Development of high resolution imaging detectors for x ray astronomy [NASA-CR-193653] p 3851 N93-32363

X RAY LASERS
Measurement of the spatial coherence of a soft x ray laser [DE93-609404] p 3731 N93-31227
Research studies in electromagnetically induced transparency [AD-A264303] p 3732 N93-31866

X RAY SPECTROSCOPY
Objectives of RESIK solar concave soft x ray spectrometer for Coronas-F mission p 3879 N93-31418

X RAY TELESCOPES
ROSAT observations of quasar 3C 273 [ETN-93-94202] p 3844 N93-31049
Observations of the quiet Sun from the soft x ray telescope on Yohkoh p 3874 N93-31388
Development of high resolution imaging detectors for x ray astronomy [NASA-CR-193653] p 3851 N93-32363

X RAYS
Proceedings of the Workshop on Application of Circularly Polarized X Rays in the Region of 1 to 8 keV [DE93-704276] p 3823 N93-31165

X-15 AIRCRAFT
The X-15/HL-20 operations support comparison [NASA-TM-4453] p 3687 N93-32379

XENON CHLORIDE LASERS
Optical and kinetic processes in excimer lasers [AD-A264210] p 3733 N93-32402

XENON FLUORIDE LASERS
Optical and kinetic processes in excimer lasers [AD-A264210] p 3733 N93-32402

Y

YAG LASERS
Cerenkov type phase-matched second harmonic generation in polymeric channel waveguides [AD-A265787] p 3710 N93-31801
Cutting parameters with Lasag lasers [DE93-010403] p 3732 N93-32288

YANG-MILLS THEORY
BRST quantization of 2D-Yang Mills theory with anomalies [NIKHEF-H/92-13] p 3831 N93-31122
A note on the Dirac canonical quantization of massive Yang-Mills theory [DE93-608199] p 3813 N93-31460

YAW
Advanced aircraft with thrust vector control [MBB-FE-1-S-PUB-0504] p 3678 N93-31043

YBCO SUPERCONDUCTORS
High temperature superconductivity: Concept, preparation and testing of high T(sub c) superconductor compounds and applications
[DE93-608696] p 3827 N93-31077
High temperature superconducting films and multilayers for electronics
[AD-A264410] p 3828 N93-31190
Study of improved critical currents and mechanical properties in YBaCuO superconductor with Ag or 211
[AD-A265749] p 3829 N93-31804
A study on the development of high T(sub c) superconducting materials
[DE93-606394] p 3720 N93-31825
Temperature dependence of the femtosecond optical response in doped high temperature superconductors
[DE93-009514] p 3829 N93-31988
YIELD STRENGTH
An investigation of squeeze-cast alloy 718
[NASA-TM-108412] p 3706 N93-31646
YUKAWA POTENTIAL
Radiative electroweak breaking and sparticle spectroscopy with tan(beta) is approximately equal to (m(sub t)) divided by (m(sub b))
[DE93-608399] p 3832 N93-31663
Lepton-quark families, cosmic strings and democratic mass matrix
[DE93-608263] p 3832 N93-31809
Complex Kohn variational principle for the solution of Lippmann-Schwinger equations
[DE93-609885] p 3814 N93-31910

Z

ZEOLITES
Interactions between tetraalkylammonium ions and silicates
[ETN-93-94057] p 3703 N93-31622
ZINC OXIDES
The determination of the thickness of the film materials by the PIXE method
[DE93-607555] p 3823 N93-31090
ZINC SULFIDES
Precipitation hardening of infrared transmitting ZnS ceramics
[AD-A265184] p 3710 N93-31993
ZIRCONIUM ALLOYS
Study on the improvement of the properties of Zr alloys
[DE93-605265] p 3706 N93-31827
ZIRCONIUM OXIDES
Tetragonal zirconia ceramics in Zr O2-Ce O2 system (CP): Preparation, characterization, and mechanical properties
[DE93-606833] p 3708 N93-31089
Zirconia ceramics and mechanical surface interactions
[ETN-93-94049] p 3709 N93-31541
ZOOM LENSES
Automatic Target Recognition (ATR) using Distributed Associative Memories (DAMS)
[AD-A265613] p 3800 N93-32169

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing

ARMSTRONG, WILLIAM D. ..... p 27 N93-10277

PERSONAL AUTHOR | PAGE NUMBER | ACCESSION NUMBER

Listings in this index are arranged alphabetically by personal author. The page number helps you locate the citation in the abstract section. The accession number denotes the number by which the citation is identified.

A

AALTIO, MATTI ..... p 3738 N93-31172
AARONS, JULES ..... p 3764 N93-32094
AARTMAN, L. J. ..... p 3714 N93-32387
AARTS, E. H. L. ..... p 3834 N93-31510
ABBOT, P. ..... p 3736 N93-32193
ABDUL-AZIZ, ALI ..... p 3696 N93-31578
ABE, O. ..... p 3721 N93-32055
ABIHANA, OSAMA A. ..... p 3784 N93-31649
ABUMERI, G. H. ..... p 3740 N93-31193
ADAM, G. ..... p 3801 N93-31067
ADAM, VOLKMAR ..... p 3676 N93-31277
ADAMCZYK, J. J. ..... p 3697 N93-31584
ADAMS, J. B. ..... p 3864 N93-31950
ADAMS, JOHN B. ..... p 3862 N93-31935
ADDY, HAROLD E., JR. ..... p 3686 N93-31670
ADELMAN, HENRY G. ..... p 3683 N93-32374
ADHIKARI, S. K. ..... p 3814 N93-31910
ADKISSON, LORI ..... p 3678 N93-32336
AFONIN, V. V. ..... p 3855 N93-31691
p 3856 N93-31699
AGUILERA-NAVARRO, V. C. ..... p 3830 N93-32405
AHMAD, ANEES ..... p 3789 N93-31637
AIME, C. ..... p 3849 N93-31779
AISAWA, E. K. ..... p 3688 N93-31439
AKASOFU, S. I. ..... p 3765 N93-32164
AKELLA, PRASAD NARASIMHA ..... p 3733 N93-31103
AKHMEDOV, E. KH. ..... p 3819 N93-31662
AKIN, DAVID ..... p 3690 N93-32118
AKINLADE, O. ..... p 3704 N93-31093
AKKELIN, S. V. ..... p 3818 N93-31241
p 3818 N93-31242
AKKERMAN, A. ..... p 3818 N93-31239
AKKERMAN, G. J. ..... p 3833 N93-31507
AKYURTLU, ATES ..... p 3684 N93-31848
AKYURTLU, JALE F. ..... p 3684 N93-31848
ALBERS, S. C. ..... p 3767 N93-31202
ALBLAS, HENK ..... p 3795 N93-31616
ALCON, JOSE L. GARCIA ..... p 3780 N93-32258
ALDER, L. J. ..... p 3690 N93-32103
ALDERMAN, C. J. ..... p 3691 N93-31168
ALDRIDGE, JACK ..... p 3688 N93-31443
ALDROVANDI, R. ..... p 3832 N93-32025
ALEKSANDROV, V. A. ..... p 3814 N93-31088
ALESSIO, DAVID ..... p 3718 N93-32414
ALEWINE, N. J. ..... p 3796 N93-32355
ALEXANDER, DAVID ..... p 3876 N93-31398
ALEXANDER, E. F. ..... p 3715 N93-32110
ALIAGA, J. ..... p 3813 N93-31301
ALISSANDRAKIS, C. E. ..... p 3872 N93-31373
ALLEN, CHERYL L. ..... p 3690 N93-32102
ALLEWIJN, ROELAND ..... p 3747 N93-32342
ALLEY, RICHARD B. ..... p 3762 N93-31899
ALLEYNE, H. S. C. ..... p 3858 N93-31708
p 3858 N93-31709
ALLTON, JUDITH H. ..... p 3863 N93-31945
ALLTOP, W. O. ..... p 3799 N93-32082
ALONSO, C. ..... p 3775 N93-32253
ALSUP, JAMES M. ..... p 3718 N93-32210
ALTROCK, RICHARD C. ..... p 3870 N93-31358
AMEEN, A. P. ..... p 3858 N93-31709
AMOROSO, MICHAEL T. ..... p 3689 N93-31454
p 3689 N93-31455
AN, NGUYEN BA ..... p 3819 N93-31666
p 3731 N93-31669
ANANDAKRISHNAN, SRIDHAR ..... p 3762 N93-31900
ANANTHANARAYAN, B. ..... p 3832 N93-31663
ANDERSEN, H. T. ..... p 3778 N93-32243
p 3778 N93-32246
p 3781 N93-32261
ANDERSON, JOHN B. ..... p 3758 N93-31879
ANDERSON, PATRICK L. ..... p 3689 N93-31455
ANDERSON, WILLIAM A. ..... p 3797 N93-32135
ANDREWS, J. P. ..... p 3858 N93-31710
ANDRIOLA, T. ..... p 3735 N93-31592
ANDRUSKIEWITSCH, N. ..... p 3808 N93-31820
ANKEN, CRAIG S. ..... p 3801 N93-32126
ANNIS, CHARLES ..... p 3706 N93-31795
ANRONSON, D. G. ..... p 3807 N93-31627
ANTIOCHOS, SPIRO K. ..... p 3874 N93-31383
ANTONUCCI, ESTER ..... p 3877 N93-31406
AOKI, R. ..... p 3701 N93-32202
APT, KRZYSZTOF R. ..... p 3787 N93-31479
p 3806 N93-31530
ARATYN, H. ..... p 3808 N93-31912
ARAUJO, E. P. ..... p 3708 N93-31179
ARCE, JULIO CESAR ..... p 3831 N93-31129
ARCH, DAVID K. ..... p 3721 N93-32033
ARDELL, A. J. ..... p 3710 N93-31993
ARDEN, M. E. ..... p 3748 N93-31070
p 3748 N93-31104
ARMSTRONG, RONALD W. ..... p 3748 N93-31105
ARMSTRONG, STEPHEN D. ..... p 3713 N93-31800
ARMSTRONG, STEPHEN H. ..... p 3782 N93-32265
ARNAUD, JEAN ..... p 3782 N93-32264
ARNDT, M. B. ..... p 3877 N93-31404
ARNONE, ANDREA ..... p 3877 N93-31402
AROCENA, JOSE IGNACIO ..... p 3723 N93-31147
ARTZNER, G. E. ..... p 3734 N93-31156
ASCHER, HAROLD ..... p 3868 N93-31348
ASCHWANDEN, MARKUS J. ..... p 3718 N93-32414
ASHE, JOHN D. ..... p 3874 N93-31387
ASHTON, GARY ..... p 3690 N93-32061
ASSMANN, G. ..... p 3840 N93-31972
ATWOOD, D. K. ..... p 3752 N93-31925
AUER, L. H. ..... p 3769 N93-31333
AUERKARI, PERTTI ..... p 3875 N93-31389
AULER, L. T. ..... p 3702 N93-32388
AULT, DARRELL ..... p 3786 N93-31248
AURASS, HENRY ..... p 3674 N93-31652
AUVERMANN, HARRY J. ..... p 3872 N93-31370
AVRETT, E. H. ..... p 3816 N93-32316
AXFORD, W. I. ..... p 3878 N93-31413
p 3867 N93-31346
p 3860 N93-31725
AZARM, S. ..... p 3803 N93-31194

B

BABCOCK, R. W. ..... p 3845 N93-31758
BACHMAIER, G. A. ..... p 3827 N93-31697
BACKES, PAUL ..... p 3801 N93-32100
BADALYAN, O. G. ..... p 3872 N93-31372
BADDILEY, C. J. ..... p 3849 N93-31781
BAGAINI, CLAUDIO ..... p 3758 N93-31606
BAGENAL, F. ..... p 3870 N93-31362
BAGGEROER, ARTHUR ..... p 3717 N93-31794
BAIK, SEONG HOON ..... p 3729 N93-31835
BAKER, ROBERT L. ..... p 3795 N93-31642
BAKKER, MONICA CATHERINA MARIA
p 3705 N93-31540
BALAKRISHNA, S. ..... p 3796 N93-32224
BALARAM, J. ..... p 3739 N93-32099
BALL, CALVIN L. ..... p 3682 N93-32351
BALL, J. V. ..... p 3809 N93-32347
BALLHAUS, W. L. ..... p 3690 N93-32103
BALOGH, A. ..... p 3826 N93-31684
BALSINGER, H. ..... p 3860 N93-31725
BANDYOPADHYAY, SUPRIYO ..... p 3832 N93-32072
BANERJEE, S. ..... p 3830 N93-32183
BANIN, AMOS ..... p 3861 N93-31933
p 3861 N93-31934
BANSAL, N. P. ..... p 3700 N93-31299
BANSAL, NAROTTAM P. ..... p 3700 N93-31293
BAO, G. ..... p 3851 N93-31073
BARASHENKOV, V. S. ..... p 3688 N93-31076
BARB, FLORIAN DAN ..... p 3798 N93-31483
BARB, FLORIN DAN ..... p 3799 N93-31851
BARBARINO, MANFRED ..... p 3775 N93-31232
BARBEE, T. W. ..... p 3731 N93-31227
BARNABA, ALPHONSE ..... p 3719 N93-31475
BARNDEN, JOHN A. ..... p 3800 N93-32341
BARNES, ROBERT A. ..... p 3770 N93-31859
BARNES, WILLIAM L. ..... p 3770 N93-31859
BARNIV, YAIR ..... p 3678 N93-32348
BARRANGER, JOHN P. ..... p 3693 N93-31558
BARRETT, R. A. ..... p 3866 N93-31961
BARRIOLA, URRUTICOECHEA MANUEL
p 3757 N93-31130
BARRON, C. C. ..... p 3823 N93-31799
BARRY, MATTHEW ..... p 3784 N93-32152
BARRY, P. J. ..... p 3713 N93-31639
BARSHAN, BILLUR ..... p 3728 N93-31125
BARTELDS, G. ..... p 3679 N93-32203
BARTH, G.-J. ..... p 3675 N93-31274
BARTLETT, RODNEY J. ..... p 3817 N93-31063
BARTON, SIMON A. ..... p 3799 N93-32036
BARUT, A. O. ..... p 3757 N93-31304
BARWINSKI, KLAUS ..... p 3744 N93-31257
BASHYAM, M. ..... p 3738 N93-31982
BASS, G. A. ..... p 3819 N93-31335
BASTIAN, T. S. ..... p 3874 N93-31387
BASTIN, PAUL ..... p 3689 N93-31457
p 3690 N93-31458
BATES, E. ..... p 3715 N93-32408
BATES, J. K. ..... p 3864 N93-31948
BATINA, JOHN T. ..... p 3673 N93-31732
BATTEEN, M. L. ..... p 3770 N93-32075
BAUER, D. ..... p 3810 N93-32398
p 3810 N93-32401
BAUER, J. ..... p 3699 N93-31044
BAVLI, RAANAN ..... p 3819 N93-31792
BEACH, T. A. ..... p 3697 N93-31584
BECK, R. ..... p 3747 N93-32343
BECKER, A. ..... p 3676 N93-31278
BECKERS, JACQUES M. ..... p 3848 N93-31773
BEDFORD, T. J. ..... p 3789 N93-31632
p 3790 N93-31656
BEERSMA, J. J. ..... p 3767 N93-31601
BEEZLEY, DALE L. ..... p 3720 N93-31842
BEGG, L. L. ..... p 3691 N93-31185
BEHNKE, J. ..... p 3841 N93-31980
BEHRENDT, JOHN C. ..... p 3761 N93-31894
p 3761 N93-31895
p 3762 N93-31901
BEJCZY, ANTAL K. ..... p 3793 N93-32119
BELL, G. E. C. ..... p 3707 N93-32302
BELL, J. F., III ..... p 3864 N93-31950
BELL, JAMES F., III ..... p 3862 N93-31935
BELL, ROBIN E. ..... p 3761 N93-31894
p 3761 N93-31895
BELMONT, G. ..... p 3719 N93-31711
BELUSSI, A. ..... p 3786 N93-31249
BELY, P.-Y. ..... p 3846 N93-31764
p 3850 N93-31786
BELYEA, C. I. ..... p 3821 N93-31913
BELYTSCHKO, T. ..... p 3695 N93-31571
BENDER, K. ..... p 3676 N93-31280
BENEDETTI, G. A. ..... p 3816 N93-32301
BENTLEY, R. D. ..... p 3879 N93-31418
BENWAY, R. L. ..... p 3769 N93-31591
BERENJI, HAMID R. ..... p 3688 N93-31444
BEREZHIANI, Z. G. ..... p 3819 N93-31662
BERGHANSEN, INGE ..... p 3837 N93-31218
BERKA, REGINALD B. ..... p 3691 N93-32121
BERKMAN, PAUL ARTHUR ..... p 3759 N93-31881
BERMAN, L. E. ..... p 3824 N93-31987
BERNASCONI, MARCO C. ..... p 3846 N93-31764
BERNSTEIN, GARY H. ..... p 3832 N93-32072
BERRY, DANIEL M. ..... p 3790 N93-31793
BERTAUX, JEAN-LOUD ..... p 3868 N93-31351
p 3878 N93-31412

BERTUCCIO, GIUSEPPE ..... p 3719 N93-31253
BESICH, W. ..... p 3781 N93-32259
BESSER, B. P. ..... p 3827 N93-31697
BETHKE, KARL-HEINZ ..... p 3716 N93-31341
BEYER, RALF ..... p 3676 N93-31276
BIBYK, STEVEN ..... p 3717 N93-31856
BIERNAT, H. K. ..... p 3827 N93-31697
BIGARD, A. X. ..... p 3778 N93-32244
BIGGERS, RAND R. ..... p 3830 N93-32211
BINDSCHADLER, ROBERT ..... p 3760 N93-31888
BINDSCHADLER, ROBERT A. ..... p 3758 N93-31878
BIRKENHEUER, D. L. ..... p 3767 N93-31202
BISCHEL, W. K. ..... p 3733 N93-32402
BISHOP, JANICE ..... p 3864 N93-31951
BISHOP, JANICE L. ..... p 3862 N93-31936
BISSON, ROGER U. ..... p 3782 N93-32264
p 3782 N93-32265
p 3782 N93-32268
BLACK, G. ..... p 3733 N93-32402
BLADOS, WALTER R. ..... p 3838 N93-31315
BLAKE, A. ..... p 3785 N93-31054
p 3785 N93-31055
BLAKE, ANDREW ..... p 3785 N93-31126
BLAKE, J. A. ..... p 3770 N93-31873
p 3771 N93-32190
p 3771 N93-32308
BLAKE, J. B. ..... p 3857 N93-31706
BLANKEN, HENK M. ..... p 3789 N93-31617
BLANKENSHIP, DONALD D. ..... p 3761 N93-31894
p 3761 N93-31895
BLECKI, J. ..... p 3859 N93-31717
BLESS, ROBERT R. ..... p 3690 N93-32381
BLODGETT, JAMES C. ..... p 3765 N93-32191
BLOKHIN, S. M. ..... p 3823 N93-31090
BLOM, C. J. ..... p 3814 N93-31633
BLOM, PAULUS WILHELMUS MARIA
p 3828 N93-31620
BLOMBERG, L. G. ..... p 3858 N93-31712
BLOMBERG, LARS G. ..... p 3860 N93-31719
BLOOMFIELD, D. P. ..... p 3720 N93-31876
BLUM, FRANK D. ..... p 3707 N93-31066
BLUMEN, WILLIAM ..... p 3766 N93-31182
BNAYAHU, YAIR ..... p 3803 N93-31224
BOCCHIALINI, K. ..... p 3874 N93-31382
BOCHSLER, P. ..... p 3880 N93-31423
p 3860 N93-31725
BODDY, MARK ..... p 3835 N93-32130
BOLIN, O. ..... p 3758 N93-31625
BOLL, PATRICIA A ..... p 3782 N93-32265
BOLL, PATRICIA A. ..... p 3782 N93-32264
p 3782 N93-32268
BONACUSE, PETER J. ..... p 3697 N93-31582
BOOKER, J. ..... p 3765 N93-32165
BOOKHOLT, H. ..... p 3701 N93-32202
BORCHARDT, B. ..... p 3714 N93-31196
BORNMANN, PAT L. ..... p 3880 N93-31421
BORNSCHAUER, KARL-HEINZ ..... p 3710 N93-32010
BOROSON, DON M. ..... p 3717 N93-31989
BORRELY, S. I. ..... p 3783 N93-32406
BOSQUED, J. M. ..... p 3766 N93-31680
BOSSOLI, ROBERT B. ..... p 3717 N93-32031
BOTHE, HELMUT ..... p 3675 N93-31271
p 3675 N93-31273
p 3675 N93-31275
BOUSSIF, A. ..... p 3774 N93-32249
BOUVIER, J. ..... p 3847 N93-31766
BOWMAN, ERIK C. ..... p 3826 N93-32047
BOWMAN, R. S. ..... p 3723 N93-31204
BOY, GUY ..... p 3801 N93-32148
BOZZOLA, M. ..... p 3714 N93-31465
BRADLEY, BARBARA L. ..... p 3782 N93-32266
BRADLEY, C. R. ..... p 3864 N93-31948
BRADSHAW, J. S. ..... p 3704 N93-31918
BRAEDEN, E. W. ..... p 3715 N93-31110
BRAKER, J. G. ..... p 3804 N93-31471
p 3787 N93-31474
BRAKKEE, E. ..... p 3724 N93-31496
BREEUWER, M. ..... p 3790 N93-31656
BREINER, CHARLES A. ..... p 3692 N93-31295
BREKKE, P. ..... p 3857 N93-31704
BRENNER, R. C. ..... p 3754 N93-32089
BRENNING, N. ..... p 3758 N93-31625
BRERETON, G. J. ..... p 3727 N93-32199
BRESKIN, A. ..... p 3818 N93-31239
BRIGHT, MICHELLE M. ..... p 3808 N93-31847
BRINDLEY, W. J. ..... p 3708 N93-31300
BRITCHER, COLIN P. ..... p 3684 N93-31836
BRODERS, M. A. ..... p 3750 N93-32281
BRODSKY, S. J. ..... p 3833 N93-32181
BROER, HENK W. ..... p 3807 N93-31623
BROMWICH, DAVID ..... p 3763 N93-31903
BRONSVOORT, WILLEM F. ..... p 3788 N93-31548
BROOKS, A. J. ..... p 3750 N93-32282
BROSIUS, J. ..... p 3876 N93-31397
BROST, R. C. ..... p 3715 N93-32104
BROWER, DANIEL ..... p 3730 N93-31975
BROWN, E. N. ..... p 3764 N93-32068
BROWN, GARY S. ..... p 3701 N93-32062
BROWNING, R. ..... p 3719 N93-31080
BROWNSTON, LEE ..... p 3801 N93-32413
BROZENA, JOHN M. ..... p 3761 N93-31894
p 3761 N93-31895
BRUECK, S. R. ..... p 3732 N93-32052
BRUECKNER, G. E. ..... p 3857 N93-31704
BRUECKNER, GUENTER E. ..... p 3868 N93-31350
BRUNO, M. S. ..... p 3751 N93-31203
BRYAN, CHARLES F., JR. ..... p 3692 N93-31295
BRYANT, D. A. ..... p 3855 N93-31694
BRYANT, ROBERT G. ..... p 3702 N93-31459
BRYCE, J. C. ..... p 3722 N93-32422
BRYNILDSEN, N. ..... p 3857 N93-31704
BU, Y. ..... p 3731 N93-31095
BUDINGER, JAMES M. ..... p 3717 N93-31856
BUECHER, ALAIN ..... p 3880 N93-31420
BUECHNER, JOERG ..... p 3856 N93-31698
BUEKER, RICHARD ..... p 3783 N93-32328
BUERGI, A. ..... p 3860 N93-31725
BUERGI, ALFRED ..... p 3880 N93-31423
BULLOCK, MARK A. ..... p 3864 N93-31949
BUONG, N. ..... p 3809 N93-32286
BURCH, J. L. ..... p 3858 N93-31710
BURGAN, R. E. ..... p 3744 N93-31213
BURGENER, MARK L. ..... p 3830 N93-32206
BURGESS, D. ..... p 3826 N93-31683
BURGIN, M. S. ..... p 3848 N93-31777
BURKE, BERNARD F. ..... p 3846 N93-31760
BURKEPILE, J. T. ..... p 3871 N93-31368
BURKS, C. ..... p 3792 N93-32299
BURKS, DAVID H. ..... p 3880 N93-31424
BURLAGA, L. F. ..... p 3857 N93-31707
BURLATON, J. P. ..... p 3774 N93-32249
BURLEIGH, SCOTT ..... p 3843 N93-32144
BURLEY, SUSAN M. A. ..... p 3748 N93-31070
p 3748 N93-31104
p 3748 N93-31105
BURNS, BRUCE P. ..... p 3687 N93-32074
BURNS, G. W. ..... p 3729 N93-31214
BURNS, JOHN A. ..... p 3808 N93-31857
BURNS, ROGER ..... p 3861 N93-31933
BURNS, ROGER G. ..... p 3862 N93-31937
p 3862 N93-31938
BURROWS, C. J. ..... p 3846 N93-31764
p 3850 N93-31786
BURSILL, L. A. ..... p 3827 N93-31175
p 3828 N93-31176
BURTON, R. ..... p 3692 N93-31310
BUSH, R. I. ..... p 3867 N93-31345
BUSHNELL, DENNIS M. ..... p 3673 N93-31732
BUSSEY, ROBERT M. ..... p 3756 N93-31062
BUSTIN, ROBERTA ..... p 3863 N93-31945
BUTTRY, DANIEL A. ..... p 3820 N93-31797
BUTTS, D. R. ..... p 3824 N93-31915
BYERS, JAMES C. ..... p 3777 N93-32012
BYKOV, V. P. ..... p 3819 N93-31286

C

CABOMONTESDEOCA, A. ..... p 3813 N93-31460
CABON, P. ..... p 3782 N93-32267
CADA, GUENTHER ..... p 3744 N93-31258
CAIN, TERRENCE M. ..... p 3722 N93-31124
CAIRNS, M. M. ..... p 3767 N93-31202
CALDWELL, J. LYNN ..... p 3782 N93-32266
CALDWELL, R. R. ..... p 3861 N93-31837
CALORI, G. ..... p 3839 N93-31605
CALVERT, W. ..... p 3882 N93-32222
CALVO, SHERRI ..... p 3840 N93-31968
CAMBIER, JEAN-LUC ..... p 3683 N93-32374
CAMPI, M. ..... p 3810 N93-32390
CANESSA, E. ..... p 3803 N93-31303
CANFIELD, R. ..... p 3860 N93-31725
CANFIELD, ROBERT ARTHUR ..... p 3739 N93-31137
CANNON, B. D. ..... p 3732 N93-32304
CANRIGHT, D. ..... p 3809 N93-32315
CANU, P. ..... p 3826 N93-31684
CAPRARI, R. S. ..... p 3802 N93-31180
CARANGELO, M. D. ..... p 3703 N93-31875
CARANGELO, R. M. ..... p 3703 N93-31875
CARCIOFINI, JIM ..... p 3835 N93-32130
CARGILL, PETER J. ..... p 3875 N93-31393
p 3875 N93-31394
p 3876 N93-31395
CARLQVIST, PER ..... p 3825 N93-31542
CARLSON, A. D. ..... p 3818 N93-31201
CARLTON, S. ..... p 3735 N93-31592
p 3736 N93-32086
CAROZZONI, JOSEPH A. ..... p 3794 N93-32156
p 3793 N93-32418
CARPENTER, THOMAS W. ..... p 3725 N93-31641
CARRIO, MIGUEL A., JR. ..... p 3791 N93-32007
CARROLL, BONNIE C. ..... p 3838 N93-31223
CARTER, M. R. ..... p 3731 N93-31227
CARVER, G. P. ..... p 3714 N93-31109
CASASSA, GINO ..... p 3760 N93-31886
CASKEY, G. ..... p 3714 N93-31196
CASPERS, WIM ..... p 3807 N93-31613
p 3807 N93-31654
CASSIDAY, B. K. ..... p 3686 N93-32122
CASSONE, VINCENT M. ..... p 3772 N93-31061
CASTANO, SILVANA ..... p 3811 N93-31476
CATURA, RICHARD ..... p 3868 N93-31348
CAVANAUGH, MICHAEL D. ..... p 3690 N93-32381
CECCATTO, H. A. ..... p 3815 N93-31806
CELENTANO, A. ..... p 3843 N93-32389
CELIO, P. ..... p 3781 N93-32259
CEO, R. N. ..... p 3704 N93-31184
CEPERLEY, PETER H. ..... p 3817 N93-32317
CERDEIRA, H. A. ..... p 3831 N93-31302
CERI, STEFANO ..... p 3811 N93-31464
p 3787 N93-31466
CHA, SOYOUNG S. ..... p 3724 N93-31438
CHAFFIN, M. H. ..... p 3730 N93-31975
CHAKRABARTI, S. K. ..... p 3851 N93-31073
CHALABAEV, A. A. ..... p 3848 N93-31777
CHAMINADE, GILLES ..... p 3803 N93-31208
CHAMIS, C. C. ..... p 3740 N93-31193
CHAMIS, CHRISTOS C. ..... p 3694 N93-31562
p 3695 N93-31572
p 3696 N93-31573
CHAMPOS, SERGIO V. ..... p 3791 N93-32044
CHAN, SIU-WAI ..... p 3829 N93-31804
CHANG, C. H. ..... p 3698 N93-32184
CHANG, C. T. ..... p 3673 N93-31839
CHANG, F. ..... p 3723 N93-31210
CHANG, I. S. ..... p 3720 N93-31825
CHANG, KEE OK ..... p 3740 N93-31823
CHANG, THIEL ..... p 3789 N93-31617
CHAPMAN, BARBARA ..... p 3792 N93-32323
CHAPMAN, R. D. ..... p 3871 N93-31369
CHASSEFIERE, E. ..... p 3868 N93-31351
CHATURVEDI, SUSHIL K. ..... p 3729 N93-31297
CHEATHAM, SAM ..... p 3840 N93-31967
p 3841 N93-31979
CHECHIK, R. ..... p 3818 N93-31239
CHEESEMAN, MITCHELL A. ..... p 3821 N93-32032
CHELAFLORES, J. ..... p 3771 N93-31161
CHEN, C. Y. ..... p 3812 N93-31083
p 3825 N93-31084
CHEN, CHUNG ..... p 3827 N93-31098
CHEN, JAMES ..... p 3875 N93-31393
p 3876 N93-31395
CHEN, TONY T. D. ..... p 3729 N93-31297
CHEN, V. W. ..... p 3690 N93-32103
CHEN, Y. ..... p 3710 N93-31801
CHENG, J. ..... p 3732 N93-32180
CHENG, JIU-HENG ..... p 3874 N93-31386
CHENG, S. ..... p 3736 N93-32192
CHERNOKOZHIN, E. V. ..... p 3766 N93-32295
CHIANG, ALEX CHIH-CHIEN ..... p 3738 N93-31107
CHIEN, STEVE ..... p 3843 N93-32144
CHIEN, STEVE A. ..... p 3730 N93-32139
CHIN, H. ..... p 3735 N93-31846
CHOE, GUM HO ..... p 3740 N93-31645
CHOENNI, SUNIL ..... p 3789 N93-31617
CHOI, M. J. ..... p 3720 N93-31825
CHONG, DIANNE ..... p 3705 N93-31192
CHOW, SHUI-NEE ..... p 3807 N93-31623
CHOYKE, W. J. ..... p 3710 N93-32010
CHRIST, RICHARD E. ..... p 3777 N93-32012
CHRISTENSEN, C. C. ..... p 3778 N93-32243
p 3781 N93-32261
CHRISTENSEN, J. ..... p 3692 N93-31310
CHRISTOFFERS, FRIEDRICH ..... p 3744 N93-31259
CHRISTOPHERSEN, A. ..... p 3778 N93-32243
CHUANG, C.-H. ..... p 3809 N93-32373
CHUNG, I. ..... p 3701 N93-32067
CLARK, BENTON C. ..... p 3862 N93-31939
CLARK, RAYMOND ..... p 3678 N93-32225
CLAUDIN, P. ..... p 3691 N93-31787
CLAUSSEN, HINRICH ..... p 3744 N93-31260
CLERK, G. J. ..... p 3829 N93-31814
p 3832 N93-31914
CLETTE, FREDERIC ..... p 3879 N93-31417
CLINE, C. F. ..... p 3706 N93-32296
CLINE, D. D. ..... p 3786 N93-31183
CLINEDINST, WINSTON C. ..... p 3680 N93-32218
COBLENTZ, A. ..... p 3782 N93-32267
COEN-PORISINI, ALBERTO ..... p 3787 N93-31252
COFFEY, H. E. ..... p 3881 N93-31436
p 3881 N93-31437
COHEN, NORMAN ..... p 3702 N93-31064
COLAVITA, M. MARK ..... p 3848 N93-31776
COLDREN, L. A. ..... p 3823 N93-31799
COLEMAN, MARTHA ..... p 3748 N93-31070
p 3748 N93-31104
p 3748 N93-31105
COLEMAN, S. S. ..... p 3795 N93-31985

COLLIN, MARIE-FRANCE ..... p 3824 N93-32105
COLLINOT, ANNE ..... p 3801 N93-32413
COLORNI, ALBERTO ..... p 3786 N93-31250
p 3792 N93-32346
p 3793 N93-32391
COLVIN, CARAN ..... p 3776 N93-32011
COMER, EDWARD R. ..... p 3791 N93-32022
p 3791 N93-32023
p 3791 N93-32024
CONNOR, J. J. ..... p 3735 N93-31727
COOK, T. J. ..... p 3778 N93-32245
COOK, TAMMY J. ..... p 3780 N93-32257
COOPER, A. E. ..... p 3693 N93-31559
COPLAN, M. ..... p 3860 N93-31725
CORNELLISSON, J. L. ..... p 3743 N93-31115
CORNILLEAU-WEHRLIN, N. ..... p 3826 N93-31684
CORNISH, N. J. ..... p 3832 N93-31911
CORNWALL, BRYAN ..... p 3681 N93-31744
COTTER, GLADYS A. ..... p 3838 N93-31315
COUDEDUFORESTO, V. ..... p 3824 N93-31783
p 3824 N93-31784
COUWENBERG, M. J. H. ..... p 3736 N93-32204
COX, G. ..... p 3850 N93-31785
COYNE, ROBERT ..... p 3840 N93-31965
CRESPO, G. ..... p 3813 N93-31301
CROARKIN, C. ..... p 3810 N93-31430
CROARKIN, M. C. ..... p 3729 N93-31214
CROISILLE, JEAN-PIERRE ..... p 3724 N93-31429
CROMARTY, ANDREW S. ..... p 3794 N93-32141
CROVELLA, MARK E. ..... p 3796 N93-32080
CROWL, LAWRENCE A. ..... p 3796 N93-32080
CRUISE, A. M. ..... p 3843 N93-31713
CRUSE, T. A. ..... p 3694 N93-31563
p 3695 N93-31568
CRUZ, M. G. ..... p 3757 N93-31304
CULP, DONALD R. ..... p 3794 N93-32146
CUNNIFF, PATRICK F. ..... p 3733 N93-31101
CUNNINGHAM, A. M., JR. ..... p 3679 N93-32338
CURDT, W. ..... p 3867 N93-31346
CURRY, DONALD M. ..... p 3727 N93-32198
CURTAIN, RUTH F. ..... p 3798 N93-31512
p 3798 N93-31513
p 3805 N93-31514
CURTIS, P. T. ..... p 3701 N93-32202
CURWEN, R. ..... p 3785 N93-31055
CUYPERS, JOHAN PETER ..... p 3828 N93-31523
CZARNOTA, BRIDGET ..... p 3836 N93-31216

D

DAGLIS, I. A. ..... p 3856 N93-31701
DAILEY, C. LEE ..... p 3698 N93-32353
DAINTY, J. C. ..... p 3846 N93-31762
DAKHNOVSKII, YURI ..... p 3819 N93-31792
DAKHOVSKII, Y. ..... p 3819 N93-31791
DAMBROSIO, BRUCE ..... p 3794 N93-32140
DAME, L. ..... p 3845 N93-31759
p 3847 N93-31768
p 3849 N93-31780
DAMMAN, SABASTIAAN BERNARDUS
p 3709 N93-31520
DAN, NGUYEN TRUNG ..... p 3819 N93-31666
p 3731 N93-31669
DANAI, K. ..... p 3735 N93-31846
DANIELSON, D. A. ..... p 3690 N93-32335
DARCOURT, J. ..... p 3849 N93-31779
DAS, HARI ..... p 3784 N93-32106
DASILVA, L. B. ..... p 3731 N93-31227
DASKALOPOULOS, C. ..... p 3780 N93-32256
DASSING, REINER ..... p 3731 N93-31340
DAVID, S. A. ..... p 3727 N93-32303
DAVIDSON, T. A. ..... p 3702 N93-31198
DAVIES, H. M. ..... p 3842 N93-32167
DAVIES, P. O. A. L. ..... p 3726 N93-31838
DAVILA, J. M. ..... p 3876 N93-31397
DAVIS, JACK ..... p 3826 N93-32020
DAVIS, MARK A. ..... p 3793 N93-32361
DAVIS, S. H. ..... p 3755 N93-32166
DAZEREDOORLANDO, MARCOS TADEU
p 3711 N93-32187
DEANDRADENONO, M. C. ..... p 3708 N93-31089
DEANGELIS, C. ..... p 3775 N93-32252
DEANGELIS, CLAUDIO ..... p 3779 N93-32248
DEBENEDET, D. ..... p 3736 N93-32194
DEBRAAL, J. D. ..... p 3862 N93-31940
DEBRAAL, JEFFREY D. ..... p 3865 N93-31956
DECKER, ARTHUR J. ..... p 3693 N93-31557
DEHAAS, ERIK ..... p 3788 N93-31528
DEHULLU, P. C. ..... p 3747 N93-32342
DEJONG, FRED ..... p 3817 N93-31149
DEJONGE, J. B. ..... p 3679 N93-32203
p 3679 N93-32205
DEKKER, A. G. ..... p 3747 N93-32344
DEKKER, L. ..... p 3795 N93-31504
DEKKING, F. M. ..... p 3789 N93-31632
p 3790 N93-31656
DEKONING, WILLEM L. ..... p 3798 N93-31483
p 3799 N93-31851
DELABOUDINIERE, JEAN-PIERRE
p 3868 N93-31348
DELLANO, M. ..... p 3830 N93-32405
DELPERAL, L. ..... p 3860 N93-31721
DELUCA, DANIEL P. ..... p 3706 N93-31795
DEMAAGT, PETER JACOBUS IRENE
p 3746 N93-31537
DEMMEL, JAMES ..... p 3809 N93-32076
DENIVELLE, H. ..... p 3807 N93-31635
DEOLIVEIRASAMPA, MARIA HELENA
p 3783 N93-32406
DEPIERO, FREDERICK W. ..... p 3719 N93-32114
DERE, KEN ..... p 3868 N93-31348
DERE, KEN P. ..... p 3877 N93-31403
DERIJKE, MAARTEN ..... p 3806 N93-31531
DEROCHE, J. ..... p 3774 N93-32249
DESROCHERS, ALAN ..... p 3801 N93-32101
DEVATY, R. P. ..... p 3710 N93-32010
DEVELYN, M. P. ..... p 3704 N93-31920
p 3829 N93-32045
DEVELYN, MARK P. ..... p 3829 N93-31921
DEVREUGHT, J. P. M. ..... p 3794 N93-31473
p 3794 N93-31493
p 3788 N93-31506
DEWAR, MICHAEL J. ..... p 3820 N93-31798
DEZERT, JEAN ..... p 3798 N93-31427
DHAWAN, ATAM P. ..... p 3694 N93-31561
DHIR, V. K. ..... p 3723 N93-31210
DIAZ, R. J. ..... p 3770 N93-31873
p 3771 N93-32190
p 3771 N93-32308
DICARLO, JAMES A. ..... p 3701 N93-32219
p 3712 N93-32382
DICKSON, RICHARD W. ..... p 3680 N93-32218
DICKSON, W. C. ..... p 3690 N93-32103
DIEDERICH, FRANCOS ..... p 3821 N93-31995
DIEGIAN, WANG ..... p 3723 N93-31146
DIMARELLIS, E. ..... p 3868 N93-31351
DIMARZO, M. ..... p 3722 N93-31114
DINSE, H. ..... p 3860 N93-31725
DISIMILE, PETER ..... p 3694 N93-31561
DJORGOVSKI, S. G. ..... p 3843 N93-32143
DOBE, Z. ..... p 3853 N93-31678
DOBREV, V. K. ..... p 3832 N93-31807
p 3807 N93-31808
DOBRY, A. ..... p 3820 N93-31805
DODDER, D. C. ..... p 3818 N93-31201
DODELSON, S. ..... p 3822 N93-32294
DOETS, KEES ..... p 3806 N93-31530
DOHERTY, MICHAEL P. ..... p 3698 N93-31858
DOLCE, JAMES L. ..... p 3734 N93-31314
DOLL, NORBERT ..... p 3851 N93-31050
DOMACK, CHRISTOPHER S. ..... p 3673 N93-31732
DOMINGO, VICENTE ..... p 3880 N93-31425
DONELSON, R. ..... p 3721 N93-32174
DORIGO, MARCO ..... p 3786 N93-31250
p 3792 N93-32346
p 3793 N93-32391
DOSREIS, R. V. V. ..... p 3708 N93-31179
DOYCHAK, J. ..... p 3705 N93-31294
DOYLE, R. J. ..... p 3843 N93-32143
DOYLE, RICHARD J. ..... p 3730 N93-32139
p 3843 N93-32144
DRAELOS, T. J. ..... p 3800 N93-32305
DRAGO, F. CHIUDERI ..... p 3873 N93-31378
DRAKE, AARON ..... p 3673 N93-32226
DRAKE, J. F. ..... p 3875 N93-31391
DRAPEAU, ANN L. ..... p 3730 N93-31970
DREIBUS, G. ..... p 3862 N93-31941
DRESHFIELD, ROBERT L. ..... p 3696 N93-31576
DROBYAZIN, V. N. ..... p 3706 N93-31660
DROUIN, N. ..... p 3786 N93-31200
DRYER, M. ..... p 3854 N93-31685
DRYER, MURRAY ..... p 3860 N93-31723
DRYSDALE, WILLIAM H. ..... p 3687 N93-32074
DUBBELDAY, WADAD B. ..... p 3722 N93-32207
DUGGAL, B. P. ..... p 3803 N93-31288
DUNFORD, C. ..... p 3858 N93-31708
DUNFORD, E. ..... p 3843 N93-31713
DUNN, B. ..... p 3710 N93-31993
DUNN, MICHAEL G. ..... p 3698 N93-31587
DUPREE, A. K. ..... p 3844 N93-31752
DURRANT-WHYTE, HUGH F. ..... p 3728 N93-31125
DURY, JOSEPH D. ..... p 3693 N93-31560
DUTTON, JAMES E. ..... p 3794 N93-32158
DYER, I. ..... p 3736 N93-32193
DYER, M. J. ..... p 3733 N93-32402

E

EARMAN, ALLEN ..... p 3730 N93-31975
EBELING, CHARLES ..... p 3812 N93-32350
ECHAHED, RACHID ..... p 3786 N93-31205
ECHELMEYER, KEITH ..... p 3761 N93-31896
ECKERT, A. ..... p 3685 N93-31207
ECONOMY, K. ..... p 3723 N93-31204
EDWARDS, D. L. ..... p 3730 N93-32366
EDWARDS, L. L. ..... p 3766 N93-32295
EHLERT, DIETER ..... p 3804 N93-31338
EICKER, P. J. ..... p 3715 N93-32104
EIKMANN, THOMAS ..... p 3753 N93-31931
EK, KARIN ..... p 3722 N93-31053
ELANGOVAN, S. ..... p 3721 N93-32174
ELLIS, JOHN M. ..... p 3671 N93-32232
ELLIS, S. D. ..... p 3822 N93-32159
ELNAGGAR, I. A. ..... p 3825 N93-31667
ELOSEGUI, PAUL ..... p 3733 N93-31150
ELSBERRY, RUSSELL L. ..... p 3767 N93-31195
ELSENAAR, A. ..... p 3684 N93-31042
ELSTER, K.-H. ..... p 3804 N93-31485
ELSTER, R. ..... p 3804 N93-31485
EMARD, JEAN-PAUL ..... p 3840 N93-31966
ENG, ANTHONY T. ..... p 3711 N93-32209
ENGELHARDT, HERMANN ..... p 3762 N93-31898
ENNIX, KIMBERLY A. ..... p 3682 N93-32220
ENTELIS, ANATOLI ..... p 3831 N93-31226
EPEMA, D. H. J. ..... p 3787 N93-31486
p 3795 N93-31864
EPSTEIN, G. L. ..... p 3875 N93-31390
ERARD, STEPHANE ..... p 3864 N93-31951
p 3865 N93-31952
ERCOLINE, WILLIAM E. ..... p 3782 N93-32265
ERCOLINE, WILLIAM R. ..... p 3782 N93-32268
ERKELENS, LOUIS J. J. ..... p 3680 N93-32416
ERONEN, T. ..... p 3869 N93-31354
ERRAMILLI, SHYAMSUNDER ..... p 3829 N93-32002
ESAIAS, WAYNE E. ..... p 3770 N93-31859
ESAREY, ERIC ..... p 3732 N93-32019
ESCOUBET, C. P. ..... p 3766 N93-31680
ESSER, RUTH ..... p 3877 N93-31402
ETEMAD, S. ..... p 3829 N93-31988
EURITT, M. A. ..... p 3712 N93-31326
p 3713 N93-31327
EVANS, D. C. ..... p 3824 N93-31915
EVANS, DAVID R. ..... p 3851 N93-32324
EVATT, B. L. ..... p 3773 N93-31140
p 3773 N93-31158
EWING, ANDREW G. ..... p 3721 N93-32001
EWINS, D. J. ..... p 3741 N93-32271
p 3683 N93-32272
p 3683 N93-32273
EYLER, JOHN R. ..... p 3821 N93-32032

F

FABIAN, PETER ..... p 3753 N93-31927
FAEHNDRICH, MANUEL ..... p 3841 N93-32048
FALTISCO, R. M. ..... p 3688 N93-31439
FALZON, BRIAN G. ..... p 3742 N93-32331
FARMER, R. C. ..... p 3698 N93-31845
FARRACE, S. ..... p 3775 N93-32252
FARRACE, STEFANO ..... p 3779 N93-32248
FARRUGIA, C. J. ..... p 3857 N93-31707
FASTOOK, JAMES ..... p 3763 N93-31904
FATEMI, N. S. ..... p 3750 N93-32201
FAUCHERRE, M. ..... p 3846 N93-31763
FAYYAD, USAMA M. ..... p 3730 N93-32139
p 3843 N93-32143
FEDOTOV, S. N. ..... p 3688 N93-31076
FEELY, R. A. ..... p 3769 N93-31333
FEIT, M. D. ..... p 3731 N93-31227
FELDER, MIGUEL ..... p 3803 N93-31251
FENBERT, JAMES W. ..... p 3673 N93-31732
FENDER, J. S. ..... p 3849 N93-31782
FENNELL, J. F. ..... p 3857 N93-31706
FERGUSON, EUGENE M. ..... p 3717 N93-32031
FERREIRA, L. A. ..... p 3808 N93-31819
p 3808 N93-31912
FERREIRAPIRES, LUIS ..... p 3788 N93-31511
FERRIGNO, J. G. ..... p 3760 N93-31885
p 3761 N93-31893
FERRIS, K. F. ..... p 3830 N93-32182
FETT, ROBERT W. ..... p 3768 N93-31922
FIEDLER, RUSS A. S. ..... p 3877 N93-31401
FIELDS, CHRISTOPHER A. ..... p 3800 N93-32341
FILIPPOV, M. A. ..... p 3861 N93-31726
FINDEISEN, DIRK ..... p 3745 N93-31261
FINE, BERNARD J. ..... p 3783 N93-32269
FINESTEAD, ARLAN ..... p 3841 N93-31978
FIORINI, PAOLO ..... p 3784 N93-32106
FIRESTONE, ELAINE R. ..... p 3770 N93-31859
p 3771 N93-32360
FISHER, FRED H. ..... p 3771 N93-32320
FISHER, M. J. ..... p 3817 N93-32339
FITZPATRICK, BEN ..... p 3811 N93-32016
FLAKE, SCOTT ..... p 3725 N93-31641
FLATAU, PIOTR JACEK ..... p 3817 N93-31154
FLESNER, LARRY D. ..... p 3722 N93-32207

FLIPPO, OLAF E. ..... p 3804 N93-31470
FOCHT, G. ..... p 3829 N93-31988
FOGG, C. T. ..... p 3743 N93-31115
FONTENLA, JUAN M. ..... p 3878 N93-31413
FORREST, DANA K. ..... p 3673 N93-31733
FORREST, S. ..... p 3792 N93-32299
FORSYTH, D. A. ..... p 3785 N93-31151
FORSYTH, R. ..... p 3826 N93-31684
FOUILLOT, J. P. ..... p 3782 N93-32267
FOX, BARRY ..... p 3835 N93-32129
FOX, D. L. ..... p 3754 N93-32088
FOX, MIKE C. ..... p 3673 N93-31733
FRANKEL, N. E. ..... p 3832 N93-31911
FRANZ, S. ..... p 3751 N93-31113
FREEMAN, G. H. C. ..... p 3729 N93-31325
FREEMAN, WILLIAM T. ..... p 3692 N93-31295
FREIS, R. P. ..... p 3766 N93-32295
FREMOUW, EDWARD J. ..... p 3756 N93-31062
FRENCH, J. ..... p 3778 N93-32245
FRENCH, JONATHAN ..... p 3780 N93-32257
p 3782 N93-32264
p 3782 N93-32265
p 3782 N93-32268
FRENDI, ABDELKADER ..... p 3816 N93-31868
FRIDGE, ERNEST M., III ..... p 3794 N93-32154
FRIEDMAN, AVNER ..... p 3808 N93-32017
FRITZEMEIER, L. G. ..... p 3696 N93-31577
FRONEK, DENNIS ..... p 3683 N93-32368
FU, GARY ..... p 3771 N93-32360
FUCHS, W. K. ..... p 3796 N93-32355
FUERSCHBACH, P. W. ..... p 3735 N93-31790
FUGINI, M. G. ..... p 3843 N93-32389
FUJIEDA, H. ..... p 3672 N93-31189
FUJIMOTO, M. ..... p 3826 N93-31682
FUJITA, T. ..... p 3672 N93-31189
FURSAEV, D. V. ..... p 3830 N93-31075
FUTSCHIK, MICHAEL W. ..... p 3709 N93-31636

G

GAASTERLAND, TERRY ..... p 3843 N93-32153
GABB, T. P. ..... p 3696 N93-31579
GABB, TIMOTHY P. ..... p 3696 N93-31576
GABBAY, D. M. ..... p 3804 N93-31480
GABRIEL, A. H. ..... p 3867 N93-31344
p 3867 N93-31346
p 3868 N93-31348
GABRIELI, JOHN D. E. ..... p 3783 N93-32269
GABRYL, J.-R. ..... p 3879 N93-31417
GAGE, B. D. ..... p 3743 N93-31116
GAIER, JAMES R. ..... p 3700 N93-31296
GAITONDE, DATTA ..... p 3673 N93-32004
GALAKHMATOVA, B. S. ..... p 3822 N93-32407
GALETTI, D. ..... p 3807 N93-31661
GALY, CHRISTINE ..... p 3719 N93-31173
GAMMEL, J. T. ..... p 3809 N93-32170
GAMWELL, W. R. ..... p 3706 N93-31646
GANGLOFF, RICHARD P. ..... p 3706 N93-31739
GAO, D. ..... p 3756 N93-32189
GARCIA, GRAHAM A. ..... p 3830 N93-32206
GARCIA, J. A. AZOFRA ..... p 3781 N93-32262
GARDNER, D. R. ..... p 3786 N93-31183
GARDNER, L. D. ..... p 3871 N93-31367
p 3880 N93-31422
GARREN, DAVID ALAN ..... p 3875 N93-31393
p 3876 N93-31395
GARRIS, M. D. ..... p 3838 N93-31331
GAT, R. ..... p 3829 N93-32045
GATELEY, WILSON Y. ..... p 3715 N93-31867
GATES, EVALYN ..... p 3861 N93-31837
GAUGER, ANITA K. ..... p 3773 N93-31917
GAUGLER, RAYMOND E. ..... p 3697 N93-31583
GAVALER, JOHN R. ..... p 3828 N93-31190
GAYDA, JOHN ..... p 3696 N93-31576
GAZZA, C. J. ..... p 3815 N93-31806
GEDWILL, MICHAEL ..... p 3729 N93-31298
GEE, TIMOTHY F. ..... p 3719 N93-32114
GEERKE, JOERG ..... p 3745 N93-31262
GEISS, J. ..... p 3860 N93-31725
GEISSLER, P. E. ..... p 3863 N93-31942
GENTILI, GIAN GUIDO ..... p 3716 N93-31607
p 3716 N93-31608
GERADIN, MICHEL ..... p 3683 N93-32274
GERASIMOV, A. V. ..... p 3819 N93-31286
GERSH, MARK ..... p 3688 N93-31440
GERTZ, MATTHEW ..... p 3793 N93-32098
GESKUS, RONALD ..... p 3811 N93-31491
GHARIB, MORTEZA ..... p 3727 N93-32310
GHOLAP, A. V. ..... p 3826 N93-31673
GIACALONE, J. ..... p 3826 N93-31683
GIBBS, W. N. ..... p 3773 N93-31140
p 3773 N93-31158
GIBREKHTERMAN, A. ..... p 3818 N93-31239
GIBSON, GARTH A. ..... p 3842 N93-32049
GIBSON, SARAH ..... p 3870 N93-31362
GIEBELS, MATTHIAS ..... p 3745 N93-31263
GILARDI, R. ..... p 3712 N93-31186
GILCHRIST, A. J. ..... p 3736 N93-32194
GILKEY, SAMUEL ..... p 3681 N93-31671
GILMAN, JOHN J. ..... p 3713 N93-31800
GIPPLE, K. ..... p 3699 N93-31065
GIULIANI, JOHN L., JR. ..... p 3826 N93-32020
GIVI, PEYMAN ..... p 3728 N93-32371
GLADDEN, HERBERT J. ..... p 3726 N93-31860
GLICKMAN, RANDOLPH D. ..... p 3772 N93-31094
GLOECKLER, G. ..... p 3860 N93-31725
GODFREY, PARKE ..... p 3843 N93-32153
GODWIN, D. A. ..... p 3711 N93-32292
GOEBEL, F. ..... p 3810 N93-32399
GOEDBLOED, J. P. ..... p 3876 N93-31396
GOEDECKE, G. H. ..... p 3816 N93-32316
GOEDHART, BOB ..... p 3790 N93-31850
GOELZ, MICHAEL ..... p 3691 N93-31048
GOETERS, KLAUS-MARTIN ..... p 3775 N93-31229
p 3775 N93-31230
p 3776 N93-31235
GOGOLEWSKI, R. P. ..... p 3706 N93-32296
GOLBRAIKH, E. I. ..... p 3861 N93-31726
GOLDEN, D. C. ..... p 3863 N93-31943
p 3864 N93-31950
GOLDSBY, JON C. ..... p 3701 N93-32219
p 3712 N93-32382
GOLEJ, JIM ..... p 3794 N93-32154
GOLINVAL, J. C. ..... p 3683 N93-32274
GOLTON, E. ..... p 3843 N93-31713
GOLUB, L. ..... p 3876 N93-31397
GOMES, J. F. ..... p 3808 N93-31819
p 3808 N93-31912
GOMEZ-MARINO, M. A. ..... p 3775 N93-32253
GONG, SUNRONG ..... p 3734 N93-31508
GONIN, M. ..... p 3880 N93-31423
GONZALEZ, A. ..... p 3803 N93-31289
GONZALEZ, OSCAR R. ..... p 3784 N93-31649
GOODING, J. L. ..... p 3866 N93-31961
GOODING, JAMES L. ..... p 3863 N93-31944
GOODRICH, KENNETH H. ..... p 3684 N93-32380
GOOSSENS, M. ..... p 3876 N93-31400
GOPALSWAMY, NATCHIMUTHKONAR ..... p 3871 N93-31365
p 3872 N93-31374
GORDON, ANDREW L. ..... p 3734 N93-31314
GORENSTEJN, M. I. ..... p 3817 N93-31059
GORNEY, DAVID ..... p 3794 N93-32142
GOROFF, NANCY S. ..... p 3821 N93-31995
GOSBEE, JOHN ..... p 3783 N93-32328
GOSSARD, A. C. ..... p 3823 N93-31799
GOULET, J. R. ..... p 3769 N93-31591
GOUTAIL, F. ..... p 3868 N93-31351
GRADY, MONICA M. ..... p 3867 N93-31962
GRAN, HELMUT ..... p 3745 N93-31264
GRANDE, M. ..... p 3857 N93-31706
GRAU, J. K. ..... p 3791 N93-32024
GREEN, MICHAEL ..... p 3798 N93-31513
GREENAWAY, A. H. ..... p 3845 N93-31756
p 3849 N93-31781
GREER, LAWRENCE C., III ..... p 3693 N93-31558
GREFEN, PAUL W. P. J. ..... p 3839 N93-31615
GREVESSE, NICOLAS ..... p 3878 N93-31408
GREWING, M. ..... p 3867 N93-31346
GRIEFAHN, BARBARA ..... p 3753 N93-31929
GRIFFIN, C. J. ..... p 3813 N93-31905
GRIFFIN, MICHAEL J. ..... p 3774 N93-32237
GRIFFITHS, A. J. ..... p 3700 N93-31736
GRISSOM, WILLIAM A. ..... p 3737 N93-32235
GROOM, NELSON J. ..... p 3715 N93-32227
GROOTES, PIETER M. ..... p 3759 N93-31883
GROSCH, C. E. ..... p 3727 N93-32095
GRUBIN, H. L. ..... p 3829 N93-32083
GRUEBEL, RUDOLF ..... p 3807 N93-31655
GRUNER, SOL M. ..... p 3829 N93-32002
GU, Y. ..... p 3692 N93-31310
GUENZEL, H. ..... p 3806 N93-31551
GUEZENNEC, C. Y. ..... p 3778 N93-32244
GUHA, SUMIT ..... p 3707 N93-32318
GUHATHAKURTA, MADHULIKA ..... p 3871 N93-31364
GULYAEV, RUDOLF A. ..... p 3872 N93-31371
GUO, D. ..... p 3809 N93-32170
GUO, F. ..... p 3809 N93-32170
GUPTA, PRAHLAD ..... p 3777 N93-32064
GURMAN, JOSEPH B. ..... p 3868 N93-31348
GUSTAFSSON, G. ..... p 3827 N93-31714
GUSTAVSSON, LARS ..... p 3815 N93-31051
GUTHRIE, W. F. ..... p 3729 N93-31214
GUTKNECHT, PETER ..... p 3753 N93-31930

H

HA, TRUONG XUAN DUC ..... p 3802 N93-31160
p 3803 N93-31285
HAAKER, T. I. ..... p 3815 N93-31653
HABBAL, S. R. ..... p 3877 N93-31402
HADDEN, GEORGE D. ..... p 3835 N93-32130
HADJIPANAYIS, G. C. ..... p 3815 N93-32291
HAEHNLEIN, GEORG ..... p 3676 N93-31279
HAERENDEL, GERHARD ..... p 3852 N93-31677
HAGIWARA, K. ..... p 3813 N93-31166
HAGWOOD, C. ..... p 3810 N93-31430
HAH, CHUNILL ..... p 3697 N93-31585
HAHN, J. P. ..... p 3736 N93-32069
HAIGIS, J. R. ..... p 3703 N93-31875
HAINES, NICK ..... p 3841 N93-32048
HAIRSTON, M. R. ..... p 3763 N93-31996
HALE, G. M. ..... p 3818 N93-31201
HALEM, M. ..... p 3841 N93-31980
HALFORD, GARY R. ..... p 3696 N93-31575
HALL, D. J. ..... p 3705 N93-31602
HALL, JOSEPH W. ..... p 3773 N93-31981
HAMADY, F. J. ..... p 3736 N93-32069
HAMAK, J. E. ..... p 3743 N93-31116
HAMEED, S. ..... p 3766 N93-32297
HAMID, G. ..... p 3785 N93-31054
HAN, JUNG HO ..... p 3706 N93-31827
HAN, PHIL SOON ..... p 3703 N93-31824
HAN, S. M. ..... p 3854 N93-31685
HAN, S. O. T. H. ..... p 3684 N93-31042
HANDY, J. ..... p 3865 N93-31954
HANSON, C. E. ..... p 3736 N93-32193
HANSSON, OTHAR ..... p 3835 N93-32134
HANUSCHIK, R. ..... p 3846 N93-31765
HAPGOOD, M. A. ..... p 3855 N93-31694
p 3857 N93-31703
p 3859 N93-31715
HARARA, WAFIK ..... p 3827 N93-31077
HARDIN, JAY C. ..... p 3673 N93-31732
HARIHARAN, P. C. ..... p 3839 N93-31964
HARPER, W. L. ..... p 3704 N93-31184
HARRIS, A. ..... p 3845 N93-31754
HARRIS, A. I. ..... p 3847 N93-31770
HARRIS, JOEL D. ..... p 3718 N93-32313
HARRIS, S. E. ..... p 3732 N93-31866
HARRISON, M. C. ..... p 3809 N93-32347
HARRISON, R. A. ..... p 3859 N93-31716
HARRISON, RICHARD A. ..... p 3868 N93-31347
p 3880 N93-31426
p 3857 N93-31703
HARRISON, WILLIAM ..... p 3761 N93-31896
HARRY, ANDREW ..... p 3790 N93-31735
HART, M. ..... p 3824 N93-31987
HARTFORD, R. A. ..... p 3744 N93-31213
HARTLEY, TOM T. ..... p 3808 N93-31847
HARVEY, T. F. ..... p 3766 N93-32295
HASHIM, A. ..... p 3842 N93-32167
HASSINEN, PERTTI ..... p 3816 N93-31865
HASSLER, DONALD M. ..... p 3880 N93-31422
HASTINGS, J. B. ..... p 3824 N93-31987
HATHAWAY, J. K. ..... p 3704 N93-31918
HAURY, H.-J. ..... p 3752 N93-31925
HAYAKAWA, H. ..... p 3856 N93-31700
HAYATI, S. ..... p 3739 N93-32099
HAYES-ROTH, BARBARA ..... p 3801 N93-32413
HEAD, JAMES ..... p 3864 N93-31951
HEAD, JAMES W. ..... p 3865 N93-31952
HEALY, R. W. ..... p 3752 N93-31829
HECK, P. ..... p 3692 N93-31310
HEELIS, R. A. ..... p 3763 N93-31996
p 3764 N93-31997
HEEMINK, A. W. ..... p 3769 N93-31497
HEGEDUS, CHARLES R. ..... p 3711 N93-32209
HEINRICH, W. ..... p 3753 N93-31928
HEINZEL, PETR ..... p 3875 N93-31392
HELLE, C. ..... p 3778 N93-32246
HELLMAN, K. H. ..... p 3736 N93-32069
HELLMANN, J. R. ..... p 3699 N93-31870
HELMICK, LARRY S. ..... p 3711 N93-32352
p 3712 N93-32367
HENDERSON, D. R. ..... p 3711 N93-32293
HENDERSON, GIRARDEAU L. ..... p 3830 N93-32211
HENDERSON, H. THURMAN ..... p 3693 N93-31560
HENDGES, ALOIS ..... p 3744 N93-31258
HENDLER, JAMES A. ..... p 3797 N93-32135
HENNINGER, R. ..... p 3711 N93-32186
HENOUX, J. C. ..... p 3878 N93-31411
HENRY, R. ..... p 3683 N93-32272
HERGENROTHER, PAUL M. ..... p 3702 N93-31459
HERSEE, S. ..... p 3732 N93-32180
HESLEGRAVE, RONALD J. ..... p 3776 N93-32011
HEULER, PAUL ..... p 3681 N93-31743
p 3682 N93-31747
p 3682 N93-31748
p 3682 N93-31749
HEUMIER, TIMOTHY ALAN ..... p 3731 N93-31131
HEUSER, GARY E. ..... p 3812 N93-32013
HEYMAN, JAMES E. ..... p 3800 N93-32334
HILEY, SHAUNA ..... p 3820 N93-31797
HILGENSTOCK, ACHIM ..... p 3681 N93-31170
HILL, RANDALL W., JR. ..... p 3719 N93-32145

HILL, SUSAN G. p 3777 N93-32012
HILL, TIM p 3739 N93-32138
HIN, ANDREA J. S. p 3788 N93-31495
HINCHEE, R. E. p 3754 N93-32089
HINES, RICHARD p 3681 N93-31671
HINTON, DAVID A. p 3680 N93-32223
HIOTT, JIM p 3794 N93-32154
HIPPENSTEELE, STEVEN A. p 3725 N93-31647
HIRSCH, EDWARD p 3781 N93-32263
HIRSCHEL, E. H. p 3843 N93-31045
HIRST, DONALD J. p 3711 N93-32209
HO, H. p 3694 N93-31564
p 3694 N93-31565
p 3695 N93-31570
HOANG, ANH TUAN p 3830 N93-32280
HOANG, S. p 3826 N93-31684
HOBSON, DENNIS A. p 3768 N93-32063
HODGE, STEVEN M. p 3761 N93-31894
p 3761 N93-31895
HODGKISS, W. S. p 3771 N93-32172
HOEBEL, LOUIS J. p 3835 N93-32132
HOEIJMAKERS, H. W. M. p 3674 N93-32357
HOEKSEMA, J. TODD p 3867 N93-31345
p 3871 N93-31366
HOFFMAN, A. p 3708 N93-31174
HOFMANN, MARTIN O. p 3800 N93-32230
HOISKO, E. p 3869 N93-31354
HOLLENBERG, L. C. L. p 3813 N93-31905
p 3813 N93-31906
HOLMAN, GORDON D. p 3873 N93-31380
HOMBURG, ALE JAN p 3806 N93-31524
HONG, G. Y. p 3720 N93-31825
HONG, JUN HWA p 3706 N93-31827
HONG, SEOK KYUNG p 3732 N93-31826
p 3729 N93-31835
HOOFMAN, RAYMOND p 3838 N93-31481
HOOKER, STANFORD B. p 3770 N93-31859
p 3771 N93-32360
HOPE, ALAN S. p 3686 N93-32081
HOPKINS, DALE A. p 3694 N93-31562
HORMANN, F. p 3843 N93-31045
HORVATH, THOMAS J. p 3673 N93-31732
HORVITZ, ERIC p 3784 N93-32152
HOUNJET, M. H. L. p 3674 N93-32358
HOURAHAN, G. C. p 3711 N93-32292
HOUTS, M. G. p 3691 N93-31185
HOVESTADT, D. p 3860 N93-31725
HOVESTADT, DIETRICH p 3869 N93-31352
HOWARD, RUSSEL D. p 3690 N93-32118
HOWARD, RUSSELL A. p 3868 N93-31348
p 3868 N93-31350
HOYNS, D. p 3699 N93-31065
HRUBY, V. J. p 3691 N93-31188
HU, Y. Z. p 3826 N93-31998
HUBER, M. C. E. p 3867 N93-31346
HUBER, MARTIN C. E. p 3880 N93-31425
HUBERT, D. p 3719 N93-31711
HUCKENPOEHLER, J. G. p 3833 N93-31328
HUESTIS, DAVID L. p 3733 N93-32402
HUFF, TIM p 3772 N93-32354
HUFF, TIMOTHY L. p 3783 N93-32356
HUIJBERTS, H. J. C. p 3801 N93-32400
HUIJSER, R. H. p 3714 N93-32387
HUKKA, T. I. p 3829 N93-32045
HULBE, CHRISTINA L. p 3761 N93-31892
HULL, D. H. p 3774 N93-32251
HUM, G. P. p 3702 N93-31209
HUMPHREYS, J. p 3751 N93-31113
HUNDHAUSEN, A. J. p 3871 N93-31368
HUNT, JAMES J. p 3852 N93-31674
HURRASS, KARLHEINZ p 3677 N93-31281
p 3677 N93-31282
HUSAIN, V. p 3802 N93-31074
p 3757 N93-31081
HUSSEIN, A. M. p 3825 N93-31667
HUSTVEDT, B. E. p 3778 N93-32243
HUSZTHY, P. p 3704 N93-31918
HUTCHINSON, JOHN J. p 3671 N93-32232
HUTTENLOCHER, D. F. p 3715 N93-32163
HWANG, SHUN-FA p 3699 N93-31136
HWU, W.-M. p 3796 N93-32355

I

IKEDA, S. p 3818 N93-31167
IM, KYUNG SOO p 3710 N93-31828
INAM, A. p 3829 N93-31988
INAZUMI, T. p 3707 N93-32302
IOANNOU, DIMITRIS E. p 3721 N93-31984
IOUP, GEORGE E. p 3756 N93-31041
p 3766 N93-32231
IOUP, JULIETTE W. p 3756 N93-31041
p 3766 N93-32231
IP, W. L. R. p 3809 N93-32347
IRBY, J. p 3830 N93-32183
IRENE, E. A. p 3710 N93-31991
p 3721 N93-31994
p 3826 N93-31998
IRISH, J. D. p 3770 N93-31983
ITOH, S. p 3698 N93-31588
IWANIK, A. p 3813 N93-31546
IWASAKI, A. p 3672 N93-31189
IWAZUMI, TOSHIAKI p 3823 N93-31165
IYER, RAVISHANKAR, K. p 3785 N93-32233
IZATT, R. M. p 3704 N93-31918

J

JACKSON, BERNARD V. p 3870 N93-31361
JACKSON, JOSEPH p 3678 N93-32336
JACOBEL, ROBERT W. p 3760 N93-31891
JAENSCH, PETER p 3676 N93-31279
JAIN, A. p 3710 N93-31801
p 3710 N93-31802
JAIN, RAVI KUMAR p 3836 N93-31132
JAMES, MARK L. p 3843 N93-32155
JAMIESON, D. N. p 3708 N93-31178
JAMISON, B. D. p 3767 N93-31202
JANI, YASHVANT p 3688 N93-31443
JANSEN, B. p 3790 N93-31659
JANSEN, BENJAMIN p 3804 N93-31470
JANSSEN, G. p 3758 N93-31594
JANY, ERIC p 3682 N93-31747
p 3682 N93-31748
p 3682 N93-31749
JARA, ELISA A. p 3717 N93-32031
JARDINE, M. p 3855 N93-31695
JAVEDANI, J. p 3692 N93-31310
JEFFRIES, RICHARD A. p 3768 N93-32005
JEGGY, THIERRY p 3740 N93-31428
JELKS, EDWARD C. p 3718 N93-32210
JEMIOLO, STANISLAW p 3742 N93-32321
JENG, R. J. p 3750 N93-32417
JENKINS, TRACI p 3863 N93-31945
JENNINGS, ANNE E. p 3759 N93-31880
JENSEN, BRIAN J. p 3702 N93-31459
JEONG, DO YOUNG p 3703 N93-31824
JEONG, YONG HWAN p 3706 N93-31827
JIN, M. p 3764 N93-32087
JOHANSSON, PER-ERIK p 3756 N93-32424
JOHN, SARAH p 3822 N93-32369
JOHNS, E. p 3770 N93-31832
JOHNSON, C. G. p 3822 N93-32312
p 3711 N93-32314
JOHNSON, K. R. p 3690 N93-32111
JOHNSON, VERLYN MARK p 3835 N93-31108
JONES, JULIE p 3678 N93-32336
JONES, R. A. p 3673 N93-31839
JONES, RAYMOND D. p 3678 N93-32225
JONES, WILLIAM R., JR. p 3711 N93-32352
p 3712 N93-32367
JONKER, CATHOLIJN p 3790 N93-31852
JORDAN, STUART D. p 3867 N93-31346
JOSSI, J. W. p 3769 N93-31591
JOY, STEVE p 3843 N93-32144
JOYCE, GLENN p 3732 N93-32019
JUCHNIEWICZ, J. p 3859 N93-31717
JULIAN, RONALD G. p 3801 N93-32109
JUNGNITZ, HAUKE p 3801 N93-32101
JUPIN, JOSEPH H. p 3843 N93-32155

K

KADIRI, S. p 3849 N93-31779
KALAU, WOLFGANG p 3831 N93-31122
KALEJS, J. P. p 3732 N93-32288
KALISH, R. p 3708 N93-31178
KALLENRODE, MAY-BRITT p 3854 N93-31686
KALLURI, SREERAMESH p 3696 N93-31575
p 3696 N93-31578
KAMATH, M. p 3697 N93-31582
p 3710 N93-31801
p 3750 N93-32417
KAMB, BARCLAY p 3762 N93-31898
KANDT, R. KIRK p 3843 N93-32144
KANG, THAE KHAPP p 3710 N93-31828
KANG, Y. H. p 3720 N93-31825
KANGAS, J. p 3860 N93-31722
KANNO, H. p 3757 N93-31305
KAPTARI, L. P. p 3820 N93-31821
KARANIAN, L. A. p 3736 N93-32194
KARL, T. p 3769 N93-32289
KARLICKY, M. p 3874 N93-31384
p 3875 N93-31392
KARTALIA, K. P. p 3693 N93-31560
KASUKABE, Y. p 3828 N93-31176
KATASHEV, A. G. p 3822 N93-32407
KAUPER, ROBERT p 3745 N93-31265
KAUPPINEN, PENTTI p 3702 N93-32388
KEANE, M. S. p 3789 N93-31632
p 3790 N93-31656
KEIL, H. p 3677 N93-31283
KELLOGG, ROBERT B. p 3754 N93-32088
KELLY, P. M. p 3842 N93-32298
KENDUS, MICHAEL p 3794 N93-32141
KENIK, E. A. p 3707 N93-32302
KENNELLY, ROBERT A., JR. p 3673 N93-32226
KENSCHE, CHRISTOPH W. p 3700 N93-31461
KEPPLER, E. p 3856 N93-31699
KEREMES, J. p 3697 N93-31580
KERRISK, D. J. p 3690 N93-32111
KETTLER, BRIAN P. p 3797 N93-32135
KEYES, B. L. P. p 3710 N93-32161
KEYSER, LEON F. p 3866 N93-31959
KHALIL, SH. M. p 3825 N93-31667
p 3826 N93-31668
KHAN, AJMAL p 3823 N93-31841
KHANDKAR, A. p 3721 N93-32174
KHOSLA, PRADEEP K. p 3793 N93-32098
KIENZLEN, VOLKER p 3702 N93-31319
KIETZKE, KAREN p 3841 N93-32048
KILGORE, W. A. p 3796 N93-32224
KILIAN-MONTENBRUCK, JUDITH p 3852 N93-31091
KILL, N. p 3683 N93-32274
KIM, BYOUNG CHUL p 3740 N93-31823
KIM, C. J. p 3720 N93-31825
KIM, CHEOL JUNG p 3732 N93-31826
p 3729 N93-31835
KIM, CHUL JOONG p 3703 N93-31824
KIM, DUK HEON p 3732 N93-31826
KIM, DUK HYUN p 3729 N93-31835
KIM, IRAIDA S. p 3872 N93-31375
KIM, J. p 3804 N93-31306
KIM, JEONG MOOG p 3732 N93-31826
p 3729 N93-31835
KIM, JUNGHO p 3698 N93-31587
KIM, K. B. p 3720 N93-31825
KIM, W. S. p 3739 N93-32099
KIM, WHUNG WHOE p 3710 N93-31828
KIM, WON CHUL p 3836 N93-31135
KIM, WON S. p 3793 N93-32119
KIM, Y.-S. p 3696 N93-31579
KIM, YONG-IN p 3807 N93-31623
KIM, YOUNG SUK p 3706 N93-31827
KIMMEL, JYRKI p 3824 N93-32421
KIMURA, TOYOAKI p 3825 N93-31097
KINDRED, DARRELL p 3841 N93-32048
KING, TODD p 3843 N93-32144
KINOSKY, D. p 3830 N93-32183
KIRCHHOFF, W. H. p 3703 N93-31817
KIRKPATRICK, J. R. p 3704 N93-31184
KIRSCH, E. p 3856 N93-31699
KIRTLEY, K. R. p 3697 N93-31584
KISTEMAKER, I. C. p 3778 N93-32241
KITSOU, A. p 3774 N93-32250
KITTRELL, CARTER p 3829 N93-31921
KIUCHI, K. p 3707 N93-32302
KJELDSETH-MOE, O. p 3857 N93-31704
KJELDSETH-MOE, OLAV p 3873 N93-31376
KLAASSEN, R. p 3738 N93-31982
KLARER, P. R. p 3737 N93-32117
KLEVENOW, F. T. p 3715 N93-31110
KLIJN, J. M. p 3680 N93-32332
KLIMCHUK, JAMES A. p 3873 N93-31377
KLIMOV, S. p 3859 N93-31717
KLIMOV, S. I. p 3826 N93-31689
KNAPP, ROGER GLENN p 3690 N93-32228
KNOROVSKY, G. A. p 3735 N93-31790
KNUDSEN, W. C. p 3853 N93-31678
KO, CHE MING p 3817 N93-31059
KOBER, AXEL p 3707 N93-31047
KOBLER, BEN p 3839 N93-31964
KOBRICK, JOHN L. p 3783 N93-32269
KOBZEV, A. P. p 3823 N93-31090
KOCA, M. p 3832 N93-31809
KOCH, CHR. BENDER p 3863 N93-31946
KOEHLER, B. p 3846 N93-31763
KOEHLER, D. p 3730 N93-32306
KOHL, JOHN L. p 3868 N93-31349
p 3871 N93-31367
p 3880 N93-31422
KOHSIEK, W. p 3746 N93-31595
KOLKMAN, H. J. p 3681 N93-31111
KOLLER, U. p 3752 N93-31925
KONG, J. A. p 3746 N93-32173
KONIJNENDIJK, PAUL ADRIAAN p 3834 N93-31518
KOOIJ, ROBERT E. p 3805 N93-31501
p 3805 N93-31505
p 3806 N93-31550
KOOMEN, MARTIN J. p 3868 N93-31350
KOONS, HARRY C p 3794 N93-32142
KOPCEWICZ, B. p 3752 N93-31831
KOPP, ROGER A. p 3869 N93-31355
KORENDYKE, C. p 3868 N93-31350
KORENYI-BOTH, A. L. p 3750 N93-32201

KORST, JOHANNES HENRICUS MARIA p 3795 N93-31522
KOSKO, BART p 3689 N93-31446
KOSOVICHEV, A. G. p 3874 N93-31385
KOSUT, ROBERT L. p 3800 N93-32197
KOTIKOV, A. V. p 3814 N93-32412
KOTSARENKO, N. Y. p 3860 N93-31724
KOUTCHMY, SERGE p 3869 N93-31357
KOUYOUMDJIEV, MARCHO STEFENOV p 3703 N93-31521
KOVALEVSKY, JEAN p 3844 N93-31751
KOWALSKI, A. M. p 3831 N93-31287
KOZO, THOMAS L. p 3768 N93-31922
KRALL, JONATHAN p 3732 N93-32019
KRAMBECK, S. D. p 3690 N93-32335
KRAMMER, P. p 3843 N93-31045
KRASOWSKI, MICHAEL J. p 3693 N93-31557
KREIMER, A. p 3751 N93-31330
KREMSER, G. p 3856 N93-31701
KRESKOVSKY, J. P. p 3829 N93-32083
KRISHEN, KUMAR p 3883 N93-32097
p 3824 N93-32105
KROEBER, I. p 3701 N93-32202
KRULL, FRANK p 3728 N93-31119
KRUPA, M. p 3807 N93-31627
KRYDER, MARK H. p 3840 N93-31971
KRYSHTAL, A. N. p 3859 N93-31718
KUCHAREK, H. p 3826 N93-31682
KUEHNE, M. p 3867 N93-31346
KUERTEN, J. G. M. p 3725 N93-31527
KUFMAN, J. G. p 3835 N93-31078
KUHLMAN, C. J. p 3700 N93-31334
KUHN, KELIN p 3824 N93-32050
KUIJPERS, E. A. p 3823 N93-31056
p 3823 N93-31118
KUK, IL HIUN p 3710 N93-31828
KUKLA, G. J. p 3769 N93-32289
KUMAR, J. p 3710 N93-31801
p 3710 N93-31802
p 3750 N93-32417
KUMAR, N. p 3827 N93-31159
KUMAR, SUSMIT p 3708 N93-31134
KUNDU, MUKUL R. p 3870 N93-31359
p 3871 N93-31365
p 3872 N93-31374
KUNOW, HORST W. p 3869 N93-31353
KUNSZT, Z. p 3822 N93-32159
KUPERUS, M. p 3853 N93-31679
KUPRA, DEBRA p 3783 N93-32328
KURIHARA, KENICHI p 3825 N93-31097
KURKELA, ESA p 3720 N93-31862
KUROSAWA, MASAYOSHI p 3792 N93-32185
KVAMSOE, K. p 3778 N93-32246
KWAST, KAREN L. p 3788 N93-31529
KWON, S. C. p 3720 N93-31825
KYRIACOU, CHRISTOS p 3707 N93-32318
KYRIAKOS, K. p 3774 N93-32250
p 3780 N93-32256
KYROLA, ERKKI p 3868 N93-31351
p 3878 N93-31412

L

LABELLE, J. p 3827 N93-31692
LABEYRIE, A. p 3691 N93-31787
LABEYRIE, ANTOINE p 3845 N93-31757
p 3691 N93-31788
LABRUJERE, T. E. p 3671 N93-31148
p 3679 N93-31840
LACOMBE, C. p 3719 N93-31711
LAFON, JEAN-PIERRE J. p 3850 N93-31789
LAKSHMINARAYANA, B. p 3698 N93-31588
LAL, D. p 3864 N93-31947
LALLEMENT, ROSINE p 3868 N93-31351
p 3878 N93-31412
LAM, KWOK-WAI p 3772 N93-31094
LAMB, M. F. p 3769 N93-31333
LAMERS, HENNY J. G. L. M. p 3848 N93-31774
LAMVIK, AUD p 3837 N93-31220
LAMY, PHILIPPE p 3868 N93-31350
LAND, SHERRY A. p 3794 N93-32146
LANDAU, DANIEL MARC p 3757 N93-31155
LANG, KENNETH R. p 3879 N93-31419
LANT, CHRISTIAN T. p 3693 N93-31558
LANTERI, H. p 3849 N93-31779
LANTOS, P. p 3872 N93-31373
LAPPERRE, PAUL ERNST p 3833 N93-31543
LARSEN, D. G. p 3718 N93-32283
LATAITIS, R. J. p 3769 N93-31815
LATTA, G. E. p 3690 N93-32335
LAUER, H. V., JR. p 3863 N93-31943
p 3864 N93-31950
LAUKKARINEN, ANJA p 3752 N93-31853
LAURIENTE, MICHAEL p 3794 N93-32142
LAVAZZA, LUIGI p 3787 N93-31252
LAVECCHIA, HELENE M. p 3777 N93-32012
LAWING, PIERCE L. p 3673 N93-31732
LAWRENCE, L. p 3691 N93-31185
LAZARIAN, ALEXANDER p 3847 N93-31767
LAZARIDES, G. p 3832 N93-31663
LEA, ROBERT p 3688 N93-31443
LEACH, MARTIN p 3718 N93-32065
LEADER, JEFFERY J. p 3800 N93-32334
LEAHY, M. B., JR. p 3686 N93-32122
LEARNER, R. C. M. p 3850 N93-31785
LEBLANC, THOMAS J. p 3796 N93-32080
LEE, CHENGCHUNG p 3827 N93-31098
LEE, DUK HYUN p 3706 N93-31827
LEE, H. G. p 3720 N93-31825
LEE, H. J. p 3720 N93-31825
LEE, JONG MIN p 3703 N93-31824
LEE, JONG PO p 3740 N93-31823
LEE, KIEN-YIN p 3712 N93-31186
LEE, L. C. p 3765 N93-32164
LEE, LORRINE p 3719 N93-32145
LEE, RICHARD p 3840 N93-31973
LEE, SAM LAI p 3740 N93-31823
LEE, SANG MOCK p 3732 N93-31826
LEE, SUKHAN p 3784 N93-32106
p 3784 N93-32108
LEE, XIANG-SENG p 3814 N93-31651
LEHTOMAEKI, JUKKA p 3752 N93-31853
LEHTONEN, MATTI p 3720 N93-31536
LELAIT, LAURENT p 3709 N93-31597
LEMAIRE, PHILIPPE p 3867 N93-31346
LEMEN, J. p 3868 N93-31348
LENA, P. p 3824 N93-31784
LENGYEL-FREY, D. p 3826 N93-31684
LENSTRA, J. K. p 3834 N93-31510
LENT, CRAIG S. p 3832 N93-32072
LEPISTOE-SAUKKO, EEVA-LIISA p 3748 N93-32420
LEPPAELAHTI, JUKKA p 3720 N93-31862
LEQUEUX, J. p 3847 N93-31770
LESTER, LAURIE S. p 3781 N93-32263
LEUQUEUX, J. p 3845 N93-31754
LEVERS, J. p 3713 N93-31639
LEVIT, SHIMON p 3831 N93-31226
LEVSTEIN, F. p 3808 N93-31820
LEWICKI, D. G. p 3735 N93-31846
LEWIS, S. M. p 3773 N93-31140
p 3773 N93-31158
LI, HAIKUAN p 3793 N93-32419
LI, L. p 3750 N93-32417
LI, M. p 3826 N93-31998
LI, X. p 3752 N93-31831
LIAN, L. p 3781 N93-32261
LIAO, Y. p 3722 N93-31114
LICEAGA, CARLOS A. p 3812 N93-31869
LIEBENBERG, DONALD H. p 3713 N93-31800
LIEBERMAN, HARRIS R. p 3783 N93-32269
LIEBERT, CURT H. p 3692 N93-31553
LIEDE, I. p 3868 N93-31351
LIM, HYUNG TAIK p 3740 N93-31823
LIN, CHIN S. p 3764 N93-32084
LIN, JOHN C. p 3673 N93-31732
LIN, KWEI-JAY p 3794 N93-32147
LIN, M. C. p 3731 N93-31095
LINDEN, THEODORE A. p 3835 N93-32128
p 3835 N93-32137
LINDQVIST, P.-A. p 3858 N93-31712
p 3860 N93-31719
LING, KECK-VOON p 3785 N93-31152
LINHARES, C. A. p 3813 N93-31181
LION, LEONARD W. p 3753 N93-32027
LIOU, MENG-SING p 3723 N93-31147
LIOY, P. J. p 3756 N93-32188
LISKOV, BARBARA p 3791 N93-32066
LITOVITZ, T. A. p 3772 N93-32035
LITVIN, M. p 3796 N93-31986
LIU, C. L. p 3794 N93-32147
LIU, JANE W. S. p 3794 N93-32147
p 3843 N93-32150
LIU, Q. p 3710 N93-31991
LIU, S. p 3860 N93-31720
LIU, W. K. p 3695 N93-31571
LIVI, S. p 3857 N93-31706
LLEBARIA, ANTOINE p 3868 N93-31350
LLOYD, CHARLES W. p 3783 N93-32328
LLUKA, P. p 3714 N93-31465
LO, R. E. p 3685 N93-31207
LOEWIK, M. R. H. p 3778 N93-32241
LOHSE, D. P. p 3771 N93-32190
p 3771 N93-32308
LONDON, R. A. p 3731 N93-31227
LONG, FRED p 3791 N93-32000
LOOIJE, C. E. W. p 3681 N93-31742
p 3682 N93-31745
p 3683 N93-32372
LOOS, G. C. p 3849 N93-31782
LOPEZ, JOSE p 3816 N93-32316
LORENTS, D. C. p 3733 N93-32402
LORENZO, CARL F. p 3697 N93-31581
LORITO, F. p 3810 N93-32390
LORITO, FABRIZIO p 3810 N93-31463
LOUHOLA, M. p 3869 N93-31354
LOUTFY, RAOUF O. p 3707 N93-32318
LOVBERG, RALPH H. p 3698 N93-32353
LOVO, A. p 3778 N93-32243
LOWRY, MICHAEL R. p 3835 N93-32128
LU, SHUQUAN p 3671 N93-31171
LUA, Y. J. p 3695 N93-31571
LUCCHITTA, B. K. p 3760 N93-31885
LUEHR, H. p 3854 N93-31688
LUKIERSKI, J. p 3807 N93-31808
LUMME, M. p 3869 N93-31354
LUMPKIN, THOMAS A. p 3754 N93-32088
LUNSFORD, J. H. p 3702 N93-31435
LUTTRELL, STEPHEN P. p 3746 N93-31611

M

MA, XIWEN p 3688 N93-31445
MA, ZHONG-SHUI p 3831 N93-31509
MACAYEAL, DOUGLAS R. p 3759 N93-31884
MACCONOCHIE, IAN O. p 3692 N93-31295
MACDOWALL, R. J. p 3826 N93-31684
MACGOWAN, B. J. p 3731 N93-31227
MACPHERSON, G. J. p 3861 N93-32415
MADNIA, CYRUS K. p 3728 N93-32371
MADSEN, EUGENE L. p 3753 N93-32027
MADSEN, M. B. p 3863 N93-31946
MAEKINEN, TUULA p 3720 N93-31862
MAESTRELLO, LUCIO p 3816 N93-31868
MAFLIET, RUDI p 3817 N93-31149
MAGEE, MICHAEL p 3777 N93-31844
MAGERL, CHRISTIAN p 3753 N93-31932
MAHADEVAN, S. p 3695 N93-31568
MAHAJAN, A. p 3830 N93-32183
MAHAJAN, S. M. p 3812 N93-31083
MAHMASSANI, H. p 3712 N93-31326
p 3713 N93-31327
MAJUMDAR, A. p 3796 N93-31986
MALBET, F. p 3847 N93-31766
MALFLIET, R. p 3830 N93-31121
MALIN, JANE T. p 3794 N93-32146
p 3801 N93-32149
MALTBY, P. p 3857 N93-31704
MANDELL, D. A. p 3711 N93-32186
MANIEZZO, VITTORIO p 3786 N93-31250
p 3792 N93-32346
p 3793 N93-32391
MANKA, AARON SCOTT p 3731 N93-31133
MANKAMYER, MELANIE p 3689 N93-31456
MANKBADI, R. R. p 3727 N93-32199
MANN, G. p 3854 N93-31688
MANN, GOTTFRIED p 3872 N93-31370
MANORY, R. R. p 3708 N93-31174
MANSFELD, G. p 3676 N93-31280
MARCUS, B. A. p 3773 N93-31138
MAREK, C. J. p 3673 N93-31839
MARGUINAUD, A. p 3685 N93-31318
MARIANOWSKI, L. p 3721 N93-32174
MARIOTTI, J.-M. p 3824 N93-31783
p 3824 N93-31784
MARIOTTI, JEAN-MARIE p 3845 N93-31755
MARKLUND, G. T. p 3858 N93-31712
p 3860 N93-31719
MARKS, N. p 3701 N93-32202
MAROS, ISTVAN p 3784 N93-31087
MARREKCHI, HAMADI p 3808 N93-31857
MARSCH, ECKART p 3867 N93-31346
p 3860 N93-31720
MARTIC, M. p 3847 N93-31768
p 3849 N93-31780
MARTIN, ANTONIO MENDEZ p 3778 N93-32247
MARTIN, F. p 3849 N93-31779
MARTIN, LISA C. p 3693 N93-31555
MARTIN, R. p 3870 N93-31363
MARTIN, S. p 3730 N93-32306
MARTIN, W. R. p 3796 N93-31986
MARTYNOV, E. S. p 3818 N93-31241
p 3819 N93-31243
MARUSKA, H. P. p 3729 N93-31191
MARVIN, U. B. p 3861 N93-32415
MASON, HELEN E. p 3877 N93-31407
MASUKO, MASABUMI p 3711 N93-32352
MATHE, NATHALIE p 3801 N93-32148
MATHIAS, L. J. p 3822 N93-32312
MATHIAS, LON J. p 3711 N93-32314
MATHUR, R. p 3754 N93-32070
MATTHEWS, D. L. p 3731 N93-31227
MATTOK, C. p 3867 N93-31343
p 3844 N93-31750
MAUCHERAT, J. p 3868 N93-31350
MAY, W. E. p 3751 N93-31816
MAYER, ANDREW p 3835 N93-32134

MAYER, GLENN NORMAN ..... p 3839 N93-31854
MAZER, J. J. ..... p 3864 N93-31948
MAZUMDAR, S. ..... p 3809 N93-32170
MCAFFEE, D. A. ..... p 3690 N93-32111
MCARTHUR, J. R. ..... p 3773 N93-31140
p 3773 N93-31158
MCCARTY, M. E. ..... p 3768 N93-31874
MCCLAIN, CHARLES R. ..... p 3770 N93-31859
p 3771 N93-32360
MCDANIEL, ROBERT L. ..... p 3782 N93-32264
p 3782 N93-32265
p 3782 N93-32268
MCDONALD, KENNETH R. ..... p 3840 N93-31968
MCDONIEL, BRIDGETT ..... p 3863 N93-31945
MCELVANY, STEPHEN W. ..... p 3821 N93-31995
MCGAW, MICHAEL A. ..... p 3696 N93-31574
p 3696 N93-31575
p 3696 N93-31578
MCGEE, WILLIAM F. ..... p 3734 N93-31292
MCGUIRE, ANDREW T. ..... p 3689 N93-31450
MCKAY, C. P. ..... p 3867 N93-31963
MCKELLAR, B. H. J. ..... p 3829 N93-31814
p 3832 N93-31914
MCKENNA-LAWLOR, S. ..... p 3869 N93-31353
p 3856 N93-31699
MCKENNA-LAWLOR, S. M. P. ..... p 3855 N93-31691
MCMILLAN, R. W. ..... p 3715 N93-31096
MCPHADEN, M. J. ..... p 3768 N93-31874
MCROBERTS, MALCOLM ..... p 3685 N93-31451
MCWHORTER, P. ..... p 3730 N93-32306
MEBIUS, J. E. ..... p 3813 N93-31502
p 3807 N93-31612
MECHERIKUNNEL, ANN T. ..... p 3770 N93-31859
MEDINA, JOSE ..... p 3860 N93-31721
MEESTER, LUDOLF E. ..... p 3811 N93-31503
MEHROTRA, PIYUSH ..... p 3792 N93-32323
MEIJER, H. G. ..... p 3806 N93-31549
MEIJER, J. J. ..... p 3679 N93-32338
MEIN, N. ..... p 3876 N93-31397
MEINSMA, GJERRIT ..... p 3798 N93-31468
MELCHER, KEVIN J. ..... p 3808 N93-31847
MELIS, MATTHEW E. ..... p 3726 N93-31860
MELLOR, GEORGE L. ..... p 3769 N93-31082
MENDILLO, MICHAEL ..... p 3764 N93-32094
MENEES, GENE P. ..... p 3683 N93-32374
MERKLE, F. ..... p 3846 N93-31763
MERRILL, WALTER C. ..... p 3697 N93-31581
MERRY, CAROLYN J. ..... p 3760 N93-31887
METIU, H. ..... p 3819 N93-31791
METIU, HORIA ..... p 3819 N93-31792
MEYER, HANS-L. ..... p 3675 N93-31272
MEYERS, D. R. ..... p 3732 N93-32180
MEZIAT, D. ..... p 3860 N93-31721
MICHALOPOULOU, S. ..... p 3774 N93-32250
MICHELS, D. ..... p 3868 N93-31348
MICHELS, D. J. ..... p 3868 N93-31350
MICHELSON, MAX ..... p 3718 N93-32414
MICKELSON, ALAN R. ..... p 3717 N93-32046
MIDDOUR, JAY ..... p 3686 N93-32081
MIGNACO, J. A. ..... p 3813 N93-31181
MIGONI, R. ..... p 3820 N93-31805
MIHN, LE NGOC ..... p 3819 N93-31666
MIKHAJLICHENKO, A. A. ..... p 3814 N93-31088
MILEY, G. H. ..... p 3692 N93-31310
MILFORD, J. ..... p 3756 N93-32189
MILLER, MARK B. ..... p 3768 N93-32043
MILLER, R. A. ..... p 3705 N93-31294
p 3708 N93-31300
MILLER, R. J. ..... p 3767 N93-31202
MILLER, R. N. ..... p 3754 N93-32089
MILLER, RONALD J. ..... p 3768 N93-32005
MILLER, STEPHEN A. ..... p 3722 N93-32207
MILLER, WILLARD, JR. ..... p 3808 N93-32017
MILLIGAN, JAMES R. ..... p 3794 N93-32158
MILLS, K. C. ..... p 3705 N93-31321
p 3705 N93-31322
p 3705 N93-31324
p 3703 N93-31603
MILLS, P. C. ..... p 3752 N93-31829
MILLWATER, HARRY R. ..... p 3694 N93-31563
p 3695 N93-31567
MING, D. W. ..... p 3863 N93-31943
MINKER, JACK ..... p 3843 N93-32153
MINTZ, DAN ..... p 3840 N93-31973
MITCHELL, ROSS P. ..... p 3770 N93-32075
MITCHELL, W. J. ..... p 3751 N93-31816
MIURA, HIROKAZU ..... p 3740 N93-32212
MOERDER, DANIEL D. ..... p 3690 N93-32381
MOGILEVSKY, M. ..... p 3859 N93-31717
MOK, Y. ..... p 3875 N93-31391
MOLINE, MARGARET ..... p 3781 N93-32263
MOLLARD, R. ..... p 3782 N93-32267
MONAHAN, PATRICK J. ..... p 3730 N93-32208
MONIN, J.-L. ..... p 3847 N93-31766
MONK, JOHN M. ..... p 3784 N93-32151
MOORE, JEFFREY M. ..... p 3864 N93-31949
MOORE, L. ..... p 3769 N93-31333
MOORE, LORETTA A. ..... p 3784 N93-31849
MOORE, ROBERT Y. ..... p 3774 N93-32015
MOORHEAD, ROBERT J., II ..... p 3686 N93-32236
MORALES, CORONA J. ..... p 3723 N93-31245
MORAN, MICHAEL D. ..... p 3765 N93-32217
MORGAN, KEITH ..... p 3794 N93-32141
MORITA, D. M. ..... p 3783 N93-32406
MORRELL, R. ..... p 3742 N93-32384
MORRIS, BERYL ..... p 3838 N93-31222
MORRIS, C. L. ..... p 3822 N93-32300
MORRIS, ED ..... p 3791 N93-32000
MORRIS, R. V. ..... p 3863 N93-31943
MORRIS, RICHARD V. ..... p 3862 N93-31935
p 3864 N93-31950
MORRIS, W. DOUGLAS ..... p 3687 N93-32379
MORRIS, WILLIAM ..... p 3739 N93-32138
MORRISON, C. ..... p 3778 N93-32242
MORRISON, P. W. ..... p 3703 N93-31875
MOSES, DAN ..... p 3877 N93-31403
MOSHER, B. W. ..... p 3767 N93-31206
MOYER, C. B. ..... p 3713 N93-31434
MROWKA, S. ..... p 3731 N93-31227
MSEZANE, A. Z. ..... p 3822 N93-32162
MUELLER-MELLIN, R. ..... p 3869 N93-31353
MUIJTJENS, RUDOLF MATHIAS ROISALIE ..... p 3725 N93-31519
MUKAI, T. ..... p 3856 N93-31700
MUKERJEE, S. ..... p 3754 N93-32088
MULARIE, BILL ..... p 3840 N93-31972
MULBRANDON, MARGARET ..... p 3826 N93-32020
MULLINS, KEVIN F. ..... p 3760 N93-31885
MUNDY, J. L. ..... p 3785 N93-31151
MUNRO, DUNCAN CRAWFORD ..... p 3747 N93-32326
MUNSON, R. ..... p 3781 N93-32259
MURAYAMA, H. ..... p 3813 N93-31166
MURCHIE, SCOTT ..... p 3864 N93-31951
MURCHIE, SCOTT L. ..... p 3865 N93-31952
MURDOCK, KELLY D. ..... p 3689 N93-31448
MURPHY, TIMOTHY JOHN ..... p 3800 N93-32216
MURRAY, S. S. ..... p 3851 N93-32363
MURSULA, K. ..... p 3860 N93-31722
MURTHY, DURBHA V. ..... p 3697 N93-31586
MUSTARD, JOHN ..... p 3864 N93-31951
MUSTARD, JOHN F. ..... p 3865 N93-31952
MUSZYNSKA, A. ..... p 3738 N93-32276
p 3738 N93-32277
p 3738 N93-32278
MYERS, TOM ..... p 3841 N93-31977
MYERS, WILLIAM NEILL ..... p 3734 N93-31313

N

NACHTRIEB, ROBERT T. ..... p 3692 N93-31291
NAGAMOTO, C. ..... p 3752 N93-31831
NAGY, A. F. ..... p 3853 N93-31678
NARANG, S. C. ..... p 3702 N93-31209
NASH, STEVEN ..... p 3697 N93-31585
NAUMOV, V. A. ..... p 3813 N93-31290
NEASE, A. D. ..... p 3715 N93-32110
NEBEL, R. ..... p 3692 N93-31310
NEGRI, M. ..... p 3786 N93-31249
NEILL, DOUGLAS J. ..... p 3740 N93-32212
NESLEIN, I. L. ..... p 3781 N93-32261
NESTLERODE, S. R. ..... p 3699 N93-31870
NEUPERT, WERNER M. ..... p 3875 N93-31390
NEVILLE, KELLY J. ..... p 3782 N93-32264
p 3782 N93-32268
NEWCHURCH, MICHAEL ..... p 3766 N93-32349
NEWELL, J. F. ..... p 3694 N93-31564
p 3694 N93-31565
p 3694 N93-31566
p 3695 N93-31570
NEWMAN, E. H. ..... p 3715 N93-31110
NEWSOM, H. E. ..... p 3865 N93-31953
NEWTON, J. J. ..... p 3834 N93-31431
NG, DANIEL ..... p 3713 N93-32330
NG, EDWARD W. ..... p 3843 N93-32155
NGUTEN, HOANG XUAN ..... p 3731 N93-31669
NGUYEN, BUONG ..... p 3809 N93-32287
NGUYEN, HUU CONG ..... p 3797 N93-32396
NGUYEN, NGOC THUAN ..... p 3830 N93-32280
NGUYEN, TOAN THANG ..... p 3830 N93-32280
NI, WEI-TOU ..... p 3849 N93-31778
NIEMINEN, A. ..... p 3869 N93-31354
NIESSEN, E. M. ..... p 3716 N93-31516
NIJMEIJER, H. ..... p 3801 N93-32400
NIKOLAEVA, N. ..... p 3859 N93-31717
NISHIDA, A. ..... p 3852 N93-31675
p 3856 N93-31700
NO, GAE HO ..... p 3706 N93-31827
NOBREGA, J. A. W. ..... p 3786 N93-31248
NOCI, GIANCARLO ..... p 3868 N93-31349
p 3870 N93-31360
NOECKER, M. C. ..... p 3845 N93-31758
NOELL, TIMOTHY E. ..... p 3719 N93-32114
NOELS, A. ..... p 3878 N93-31408
NOENS, JACQUES-CLAIR ..... p 3880 N93-31420
NOMURA, MASAHARU ..... p 3823 N93-31165
NORDMANN, R. ..... p 3738 N93-32275
NORTH, JIM ..... p 3671 N93-32232
NOTHNAGEL, AXEL ..... p 3746 N93-31339
NOVAES, S. F. ..... p 3832 N93-32025
NOVIK, LEV ..... p 3843 N93-32153
NOWLAN, DAN ..... p 3689 N93-31453
NOZDRACHEV, M. ..... p 3859 N93-31717
NOZDRACHEV, M. N. ..... p 3827 N93-31690
NUGENT, K. A. ..... p 3832 N93-31909

O

OBENHUBER, D. C. ..... p 3772 N93-32365
OBERLE, LAWRENCE G. ..... p 3693 N93-31558
ODOWD, J. ..... p 3750 N93-32177
OETLIKER, M. ..... p 3880 N93-31423
OH, SEOK JIN ..... p 3710 N93-31828
OHARA, K. ..... p 3694 N93-31566
OKKO, OLLI ..... p 3816 N93-31865
OLANDER, ANNA BIRGITTA ..... p 3842 N93-32325
OLIN, GEORGE R. ..... p 3730 N93-31974
OLIVEIRA, F. B. ..... p 3780 N93-32255
OLK, J. G. E. ..... p 3794 N93-31473
OMIDVAR, O. M. ..... p 3797 N93-31332
ONG, LISA ..... p 3671 N93-32232
OOSTERLEE, C. W. ..... p 3724 N93-31496
p 3725 N93-31657
OPALKA, KLAUS O. ..... p 3685 N93-31916
OPAT, G. I. ..... p 3818 N93-31228
p 3823 N93-31246
OPPENHEIM, ALAN V. ..... p 3717 N93-31794
ORENBERG, J. B. ..... p 3865 N93-31954
ORIENT, G. ..... p 3697 N93-31580
OSHEROVICH, V. A. ..... p 3857 N93-31707
OSINSKI, M. ..... p 3732 N93-32180
OSULLIVAN, D. ..... p 3856 N93-31699
OSWALD, R. ..... p 3750 N93-32177
OTTEN, L. J., III ..... p 3849 N93-31782
OTTERBEIN, KAI ..... p 3844 N93-31049
OUDSEMA, JOHN WAYNE ..... p 3704 N93-32327
OVERLY, JOYCE ..... p 3704 N93-31919
OVERMAN, ANDREA ..... p 3793 N93-32359

P

PADDAN, GURMAIL S. ..... p 3774 N93-32237
PADDON, J. M. ..... p 3742 N93-32384
PADMAN, RACHAEL ..... p 3848 N93-31772
PAETZOLD, UWE ..... p 3739 N93-31057
PAGALTHIVARTHI, K. ..... p 3700 N93-31334
PAGAN, DIDIER ..... p 3724 N93-31477
PAIK, HAE SEUNG ..... p 3710 N93-31828
PALERMOS, J. ..... p 3774 N93-32250
p 3780 N93-32256
PALETOU, F. ..... p 3875 N93-31389
PALM, N. ..... p 3841 N93-31980
PAN, KEE-CHUAN ..... p 3730 N93-31974
PANKAKOSKI, PEKKA H. ..... p 3702 N93-32388
PANKEN, F. J. M. ..... p 3812 N93-32392
PANTELLINI, F. ..... p 3826 N93-31684
p 3719 N93-31711
PARASHAR, P. ..... p 3802 N93-31162
PARENTI, RONALD R. ..... p 3850 N93-31990
PARETZKE, H. G. ..... p 3753 N93-31928
PARK, GI SUNG ..... p 3706 N93-31827
PARK, JI YUN ..... p 3706 N93-31827
PARKER, J. D. ..... p 3721 N93-32079
PARKHOMCHUK, V. V. ..... p 3814 N93-31088
PARR, C. H. ..... p 3700 N93-31334
PARSONS, R. ..... p 3792 N93-32299
PARTLOW, W. D. ..... p 3710 N93-32010
PARUNGO, F. ..... p 3752 N93-31831
PARZIALE, A. A. ..... p 3744 N93-31187
PASCHKE, J. ..... p 3872 N93-31370
PATERSON, P. J. K. ..... p 3708 N93-31174
PATTERSON, R. H. ..... p 3842 N93-32049
PATTERSON, RICHARD L. ..... p 3812 N93-31145
PAUSCH, K. ..... p 3846 N93-31765
PAVCO, JOHN ..... p 3718 N93-32414
PEARSON, JACQUELYN Y. ..... p 3782 N93-32266
PEASE, P. ..... p 3841 N93-31980
PEASE, R. F. ..... p 3719 N93-31080
PEAT, K. S. ..... p 3815 N93-31599
PECK, CHARLES, III ..... p 3694 N93-31561
PEDRESCHI, DINO ..... p 3787 N93-31479
PEECOOK, KEITH M. ..... p 3698 N93-31858
PEELLE, R. W. ..... p 3818 N93-31201
PEIRIS, DILRUKSHI M. ..... p 3821 N93-32032
PELAGATTI, G. ..... p 3786 N93-31249
PELLECHI, M. ..... p 3686 N93-32178

PELLINEN-WANNBERG, ASTA ... p 3852 N93-31624
PELLINEN, R. ... p 3868 N93-31351
PELTONEN, P. ... p 3869 N93-31354
PENG, JULIN ... p 3827 N93-31175
PENROD, JEFF ... p 3689 N93-31447
PERA, C. J. ... p 3713 N93-31434
PEREYRA, V. ... p 3758 N93-31872
PEREZ, G. ... p 3831 N93-31302
PERRONE, MICHAEL P. ... p 3799 N93-32073
PERRY, C. H. ... p 3857 N93-31706
PETER, KLAUS J. ... p 3730 N93-31969
PETERKA, ROBERT J. ... p 3774 N93-32364
PETERS, C. A. ... p 3752 N93-31829
PETERSSON, N. A. ... p 3727 N93-32175
PETRUKOVICH, A. ... p 3859 N93-31717
PETRUKOVICH, A. A. ... p 3827 N93-31690
PHAM, CHUONG N. ... p 3830 N93-32211
PHAM, TRUNG T. ... p 3689 N93-31452
PHELAN, MICHAEL J. ... p 3770 N93-32037
PHELAN, R. S. ... p 3735 N93-31727
PHILIPP, WARREN H. ... p 3709 N93-31316
PHILLIPS, J. D. ... p 3845 N93-31758
PHILLIPS, S. D. ... p 3714 N93-31196
PHU, NGUYEN DINH ... p 3802 N93-31072
p 3802 N93-31079
PICRAUX, T. ... p 3830 N93-32183
PIEKARCZYK, W. ... p 3708 N93-31177
PIERRE, CHRISTOPHE ... p 3697 N93-31586
PIETERS, CARLE ... p 3864 N93-31951
PIETERS, CARLE M. ... p 3862 N93-31936
PIETERSEN, O. B. M. ... p 3675 N93-31120
PIKKARAINEN, T. ... p 3860 N93-31722
PILLINGER, C. T. ... p 3067 N93-31962
PILLSBURY, ALLEN D. ... p 3717 N93-31989
PIMENTEL, B. M. ... p 3807 N93-31661
PIN, EANCOIS G. ... p 3737 N93-32116
PITOVRANOV, S. E. ... p 3766 N93-32295
PIURI, VINCENZO ... p 3797 N93-31254
p 3797 N93-31255
PLANTIER, CHRISTOPHE ... p 3728 N93-31127
PLASTINO, A. ... p 3831 N93-31287
PLUMB, ALLAN ... p 3794 N93-32154
PLUMB, ROBERT C. ... p 3865 N93-31955
PLUMLEE, G. S. ... p 3862 N93-31940
PLUMLEE, GEOFFREY S. ... p 3865 N93-31956
PODZIREJ, YU. S. ... p 3706 N93-31660
POEDTS, STEFAAN ... p 3876 N93-31396
POENITZ, W. P. ... p 3818 N93-31201
POHLAND, ROBERT D. ... p 3733 N93-31101
POINSATTE, PHILIP E. ... p 3725 N93-31647
POLER, J. C. ... p 3721 N93-31994
POLETTO, GIANNINA ... p 3870 N93-31360
POLLAK, CHARLES P. ... p 3781 N93-32263
POLLAK, M. ... p 3810 N93-31430
POLOVNEVA, S. P. ... p 3706 N93-31660
POORE, AUBREY B. ... p 3792 N93-32096
POPP, C. J. ... p 3751 N93-31212
POROD, WOLFGANG ... p 3832 N93-32072
PORTA, HARRY J. ... p 3730 N93-32139
PORTENEUVE, J. ... p 3847 N93-31768
PORTER, JASON G. ... p 3877 N93-31405
POST, FRITS H. ... p 3724 N93-31494
POTTELETTE, R. ... p 3827 N93-31692
POTTER, J. ... p 3751 N93-31113
POVINELLI, LOUIS A. ... p 3723 N93-31147
POWELL, G. L. ... p 3704 N93-31184
POWELL, JOHN D. ... p 3687 N93-32074
POWERS, W. T. ... p 3693 N93-31559
POZZI, S. ... p 3843 N93-32389
PRASAD, KALLAVI GURU ... p 3802 N93-31141
PRASAD, V. ... p 3739 N93-32099
PRAWER, S. ... p 3708 N93-31174
p 3708 N93-31177
p 3708 N93-31178
PRESSBURGER, THOMAS T. ... p 3791 N93-32059
PRESTON, G. A. ... p 3817 N93-32339
PREUSS, DONALD R. ... p 3730 N93-31974
PRICE, SCOTT A. ... p 3777 N93-32006
PRIEST, E. R. ... p 3873 N93-31381
p 3852 N93-31676
PRIMATAROWA, M. T. ... p 3827 N93-31100
PRITCHARD, A. J. ... p 3805 N93-31514
PROETTO, C. R. ... p 3825 N93-31164
PROKHOROV, L. V. ... p 3830 N93-31075
PROTO, A. N. ... p 3831 N93-31287
p 3813 N93-31301
PROTOGENOV, A. P. ... p 3827 N93-31163
p 3810 N93-31307
PROUSE, D. ... p 3721 N93-32174
PRUEST, HUB ... p 3787 N93-31478
PSIAKI, MARK L. ... p 3795 N93-31640
PURVIS, J. W. ... p 3737 N93-32117

Q

QAMMAR, HELEN K. ... p 3608 N93-31847
QIAN, R. ... p 3830 N93-32183
QUANG, NGUYEN HONG ... p 3819 N93-31665
QUEEN, ERIC M. ... p 3690 N93-32381
QUINN, R. ... p 3865 N93-31954

R

RAADU, MICHAEL A. ... p 3825 N93-31626
RADEMAKER, E. R. ... p 3680 N93-32332
RAFLA, NADER I. ... p 3737 N93-32235
RAIZENNE, M. D. ... p 3682 N93-31746
RAJAGOPAL, K. R. ... p 3694 N93-31565
p 3694 N93-31566
p 3697 N93-31580
RAJAN, P. K. ... p 3823 N93-31841
RAMAN, GANESH ... p 3672 N93-31672
RAMANATHAN, RAGULAN ... p 3821 N93-32032
RANDELL, G. P. ... p 3787 N93-31337
RASHID, R. I. M. A. ... p 3827 N93-31086
RASILAINEN, KARI ... p 3821 N93-31863
RATHJE, HERMANN ... p 3775 N93-31229
p 3775 N93-31231
p 3775 N93-31233
p 3776 N93-31234
p 3776 N93-31238
RATHKOPF, J. A. ... p 3796 N93-31986
RAUTER, MICHEAL ... p 3679 N93-31046
RAWLES, ROBIN E. ... p 3829 N93-31921
RAYCHAUDHURI, PRANAB. K. ... p 3730 N93-31974
RAYMOND, CHARLES F. ... p 3762 N93-31897
REAMES, DONALD V. ... p 3878 N93-31410
REASENBERG, R. D. ... p 3845 N93-31758
RECAMI, E. ... p 3821 N93-31907
p 3832 N93-31908
REDDY, E. S. ... p 3740 N93-31193
REED, M. H. ... p 3862 N93-31940
REEDY, RONALD E. ... p 3830 N93-32206
REGIAN, J. WESLEY ... p 3784 N93-32151
REINLEITNER, LEE A. ... p 3756 N93-31062
REISDORFER, DALE ... p 3701 N93-32234
REITZE, D. H. ... p 3829 N93-31988
RENNE, OLIVIER ... p 3682 N93-31748
RESING, J. A. C. ... p 3804 N93-31471
REZEAU, L. ... p 3855 N93-31693
RHOADS, D. C. ... p 3770 N93-31873
RHODES, BRANDT ... p 3689 N93-31449
RHODES, ERIC L. ... p 3691 N93-32124
RIBEIRO, N. L. ... p 3780 N93-32255
RICCO, T. ... p 3730 N93-32306
RICE, EDWARD J. ... p 3672 N93-31672
RICHANBACH, PAUL H. ... p 3834 N93-32311
RICHARD, R. ... p 3774 N93-32249
RICHARDS, STEPHEN F. ... p 3835 N93-32129
RICHARDSON, W. G. ... p 3773 N93-31138
RICOTTA, R. M. ... p 3808 N93-31819
RIDDELL, FREDERICK R. ... p 3834 N93-32311
RIDDERBOS, ASTRID ... p 3811 N93-31618
RIDGWAY, STEPHEN T. ... p 3844 N93-31753
p 3846 N93-31761
p 3824 N93-31783
RIDLEY, W. IAN ... p 3865 N93-31956
RIEU, NGUYEN-QUANG ... p 3847 N93-31771
RIIHELA, P. ... p 3868 N93-31351
RIIHONEN, E. ... p 3869 N93-31354
RIJNBEEK, R. P. ... p 3855 N93-31696
RINAUDO, C. ... p 3714 N93-31465
RINGERTZ, ULF ... p 3739 N93-31123
RINNE, T. ... p 3860 N93-31722
RIOS, F. ... p 3775 N93-32253
RISCH, U. ... p 3805 N93-31488
p 3805 N93-31489
RISH, JEFF W., III ... p 3830 N93-32211
RISSER, S. M. ... p 3830 N93-32182
RITCHIE, A. G. ... p 3722 N93-32422
ROBBINS, FREDERICK W. ... p 3713 N93-32030
ROBERTS, A. ... p 3832 N93-31909
ROBERTS, NANCY A. ... p 3794 N93-32157
ROBERTSON, CHARLIE ... p 3739 N93-32138
RODDIER, F. ... p 3846 N93-31764
p 3850 N93-31786
RODE, T. ... p 3781 N93-32261
RODEN, J. C. ... p 3843 N93-32143
RODEN, JOSEPH ... p 3843 N93-32144
RODRIGUES, W. A., JR. ... p 3821 N93-31907
p 3832 N93-31908
RODRIGUEZ, ALEJANDRO ... p 3798 N93-31512
RODRIGUEZ, C. ALONSO ... p 3781 N93-32262
RODRIGUEZ, P. ... p 3700 N93-31650
ROEDER, KARL-HEINZ ... p 3745 N93-31266
ROEDIG, ERICH ... p 3775 N93-32254
ROELOFS, A. F. ... p 3788 N93-31506
ROERDINK, J. B. T. M. ... p 3789 N93-31629
ROGERS, CHARLES ... p 3701 N93-32234
ROHDE, SHARON ... p 3791 N93-32024
ROHDE, SHARON L. ... p 3791 N93-32022
ROJAS, R. G. ... p 3715 N93-31110
ROLINCIK, MARK ... p 3794 N93-32142
ROMAN, W. C. ... p 3711 N93-32307
ROMANOV, S. ... p 3859 N93-31717
ROMANOVSKJ, E. A. ... p 3822 N93-32407
ROMERO, J. J. CANTON ... p 3781 N93-32262
RON, AMOS ... p 3808 N93-31999
ROOS, C. ... p 3790 N93-31659
ROSEN, JAMES M. ... p 3758 N93-31803
ROSENBAUER, H. ... p 3860 N93-31720
ROSS, HANNES ... p 3678 N93-31043
ROSS, MARK M. ... p 3821 N93-31995
ROSSITER, M. J. ... p 3819 N93-31335
ROSSOL, GUENTER ... p 3745 N93-31267
ROTH, MARTIN ... p 3681 N93-31744
ROTHWELL, C. A. ... p 3785 N93-31151
ROUGE, C. J. ... p 3708 N93-31300
ROUNTREE, JANET ... p 3861 N93-31737
ROUSH, TED L. ... p 3866 N93-31957
ROUX, A. ... p 3855 N93-31693
ROY, S. ... p 3700 N93-31334
RUDOWSKI, JERZY ... p 3722 N93-32214
RUIZ, A. C. ... p 3801 N93-32400
RUOKANGAS, CORINNE ... p 3784 N93-32152
RUSAK, BENJAMIN ... p 3774 N93-32018
RUSSELL, C. T. ... p 3855 N93-31693
RUSSELL, D. A. ... p 3696 N93-31577
p 3697 N93-31580
RUSSELL, LOUIS M. ... p 3725 N93-31647
RUSSELL, MARTIN J. ... p 3716 N93-31610
RUTA, MARY ... p 3783 N93-32328
RUTTEN, ROBERT J. ... p 3848 N93-31775
RUUHILEHTO, KAARIN ... p 3714 N93-31545
RYBICKI, DANIEL J. ... p 3734 N93-31292
RYNDYK, D. A. ... p 3827 N93-31163

S

SABA, JULIA L. R. ... p 3879 N93-31416
SACHER, P. W. ... p 3843 N93-31045
SADEH, NORMAN M. ... p 3835 N93-32133
SAGOVAC, C. P. ... p 3690 N93-32335
SAIKI, NEAL ... p 3673 N93-31855
SAKARA, L. ... p 3775 N93-32252
SAKARA, LORENZO ... p 3779 N93-32248
SALADINO, A. J. ... p 3698 N93-31845
SALTER, CHARLES A ... p 3781 N93-32263
SALTHOUSE, ROBERT W. ... p 3713 N93-32085
SAMI, MARIAGIOVANNA ... p 3797 N93-31254
p 3797 N93-31255
SAMPATH, K. S. ... p 3715 N93-31110
SANCHEZ, S. ... p 3860 N93-31721
SANCHEZBRINGAS, F. ... p 3813 N93-31102
SANDLIN, DORAL R. ... p 3673 N93-31855
SANNIKOV, S. S. ... p 3818 N93-31240
SARIC, WILLIAM S. ... p 3816 N93-32238
SARMADI, M. H. ... p 3757 N93-31305
SARRIS, E. T. ... p 3856 N93-31701
SASIELA, RICHARD J. ... p 3850 N93-31990
SATSANGI, A ... p 3692 N93-31310
SATSANGI, H. ... p 3792 N93-32239
SAUNDERS, S. R. J. ... p 3705 N93-31602
SAUVAL, A. J. ... p 3878 N93-31408
SAVIN, S. ... p 3859 N93-31717
SAWYER, ERIC C. ... p 3868 N93-31347
SAYED, Y. A. ... p 3826 N93-31668
SAYLES, G. D. ... p 3754 N93-32089
SCAMBOS, TED A. ... p 3760 N93-31890
SCATTOLINI, R. ... p 3714 N93-31465
SCHA, REMKO ... p 3787 N93-31478
SCHAEFER, M. W. ... p 3866 N93-31958
SCHARRER, JOSEPH K. ... p 3735 N93-31731
SCHEIK, J. T. ... p 3715 N93-31110
SCHENKER, PAUL S. ... p 3793 N93-32119
SCHERE, K. L. ... p 3754 N93-32070
SCHERER, REED P. ... p 3759 N93-31882
SCHERRER, J. R. ... p 3858 N93-31710
SCHERRER, P. H. ... p 3867 N93-31345
SCHMAHL, EDWARD J. ... p 3871 N93-31365
p 3872 N93-31374
SCHMEICHEL, E. ... p 3810 N93-32398
p 3810 N93-32401
SCHMIDT, MATTHIAS ... p 3679 N93-31197
SCHMIDT, W. ... p 3868 N93-31351
SCHMIEDER, B. ... p 3876 N93-31397
SCHNEIDER, THOMAS ... p 3837 N93-31219
p 3820 N93-31797
SCHNUR, G. F. O. ... p 3846 N93-31765
p 3847 N93-31768
SCHOLER, M. ... p 3826 N93-31682
SCHOLTES, J. C. ... p 3798 N93-31469
p 3788 N93-31517

SCHOT, JEROEN ..... p 3788 N93-31511
SCHRA, L. ..... p 3707 N93-32385
SCHRECK, STEFAN ..... p 3816 N93-32221
SCHRECKENGHOST, DEBRA L. . p 3801 N93-32149
SCHREIBER, FABIO A. ..... p 3842 N93-32383
SCHUETZ, WALTER ..... p 3682 N93-31749
SCHULLER, FREDERICK T. ..... p 3686 N93-31670
SCHULTEN, J. B. H. M. ..... p 3683 N93-32386
SCHULTZ, C. G. ..... p 3879 N93-31415
SCHULTZ, G. ..... p 3880 N93-31426
SCHULZ, G. ..... p 3869 N93-31354
SCHULZ, P. ..... p 3677 N93-31283
SCHULZE, N. ..... p 3692 N93-31310
SCHULZE, NORMAN R. ..... p 3712 N93-31308
p 3825 N93-31309
p 3685 N93-31312
SCHUMANN, ULRICH ..... p 3752 N93-31926
SCHUTT-AINE, J. E. ..... p 3792 N93-32239
SCHWARTZ, D. A. ..... p 3851 N93-32363
SCHWARTZ, DOUGLAS B. ..... p 3687 N93-32113
SCHWARTZ, ERIC L. ..... p 3743 N93-31060
SCHWARTZ, S. J. ..... p 3826 N93-31683
p 3843 N93-31713
SCHWENN, RAINER ..... p 3868 N93-31350
p 3856 N93-31702
SCHWIEDER, P. R. ..... p 3718 N93-32283
SCHWINGENSCHUH, K. ..... p 3856 N93-31699
SCINOCCA, JOHN F. ..... p 3757 N93-31106
SCIUTO, DONATELLA ..... p 3797 N93-31254
SCKOPKE, NORBERT ..... p 3854 N93-31687
SCOTT, MICHAEL L. ..... p 3796 N93-32080
SCROGER, M. G. ..... p 3729 N93-31214
SCULLY, JOHN R. ..... p 3706 N93-31739
SEAMAN, B. ..... p 3751 N93-31113
SEASHOLTZ, RICHARD G. ..... p 3693 N93-31556
SECAN, JAMES A. ..... p 3756 N93-31062
SEGAL, A. ..... p 3724 N93-31496
SEGALL, ALBERT ELIOT ..... p 3739 N93-31139
SEIDEL, STEVEN R. ..... p 3793 N93-32361
SEIGNEURIC, A. ..... p 3774 N93-32249
SEMENOV, V. S. ..... p 3827 N93-31697
SENGUPTA, S. ..... p 3710 N93-31802
SENJANOVIC, G. ..... p 3819 N93-31662
SENNE-DUFF, BETH ..... p 3780 N93-32257
SEQUEIROS, J. ..... p 3869 N93-31353
SERAFIN, J. ..... p 3813 N93-31546
SERAJI, H. ..... p 3739 N93-32099
SERYJ, A. A. ..... p 3814 N93-31088
SESTER, MONIKA ..... p 3745 N93-31268
SHABANOV, S. V. ..... p 3830 N93-31075
SHABTAIE, SION ..... p 3760 N93-31889
SHAFI, Q. ..... p 3832 N93-31663
SHAH, ASHWIN R. ..... p 3696 N93-31573
SHALABY, M. A. ..... p 3809 N93-32284
SHAMANSKY, H. T. ..... p 3715 N93-31110
SHANTHIKUMAR, J. GEORGE ... p 3811 N93-31503
SHAO, MICHAEL ..... p 3849 N93-31778
SHAPIRO, V. D. ..... p 3853 N93-31678
SHARMA, M. M. ..... p 3764 N93-32087
SHARMA, S. ..... p 3824 N93-31987
SHATTUCK, JOHN S. ..... p 3768 N93-32008
SHAW, ROBERT J. ..... p 3681 N93-31671
SHEBILSKE, WAYNE ..... p 3784 N93-32151
SHEHTMAN, VALENTIN ..... p 3804 N93-31480
SHEVCHENKO, V. I. ..... p 3853 N93-31678
SHIAO, MICHAEL C. ..... p 3695 N93-31572
SHIH, HSUEH-CHI ..... p 3836 N93-31144
SHILTSEV, V. D. ..... p 3814 N93-31088
SHIMAMOTO, MIKE S. ..... p 3784 N93-32112
SHIN, JANG SOO ..... p 3732 N93-31826
SHIROKOV, D. M. ..... p 3823 N93-31090
SHITIKOVA, K. V. ..... p 3822 N93-32407
SHOHAM, YOAV ..... p 3794 N93-32136
SHY, C. M. ..... p 3754 N93-32088
SHY, JOW-TSONG ..... p 3849 N93-31778
SIDORAN, KAREN M. ..... p 3794 N93-32127
SIEBERT, B. W. ..... p 3726 N93-32071
SIEBOLD, JOACHIM ..... p 3678 N93-31269
SIEGWART, ROLAND ..... p 3738 N93-32279
SIERKS, H. ..... p 3869 N93-31353
SIEWIOREK, DANIEL P. ..... p 3812 N93-31869
SIGALO, F. B. ..... p 3826 N93-31673
SIGETY, P. ..... p 3701 N93-32202
SIGNELL, RICHARD P. ..... p 3770 N93-31983
SILLANPAEAE, JUHA ..... p 3738 N93-31172
SILVEIRA, S. R. ..... p 3780 N93-32255
SIME, D. G. ..... p 3857 N93-31703
p 3859 N93-31716
SIMEONIDES, G. ..... p 3672 N93-31538
SIMNETT, GEORGE M. ..... p 3874 N93-31384
p 3876 N93-31399
SIMONYI, PATRICIA S. ..... p 3725 N93-31647
SINGER, R. B. ..... p 3863 N93-31942
SINGH, D. D. ..... p 3820 N93-31822
SKALSKY, A. ..... p 3859 N93-31717
SKIDMORE, JENNIFER D. ..... p 3835 N93-32131
SLATER, TIMOTHY ..... p 3782 N93-32264
p 3782 N93-32265
SLOMINSKI, CHRISTOPHER J. ... p 3680 N93-32218
SLOOFF, J. W. ..... p 3671 N93-31148
SMARTT, RAYMOND N. ..... p 3873 N93-31379
SMIALEK, J. L. ..... p 3708 N93-31300
SMIALEK, JAMES L. ..... p 3729 N93-31298
SMITH, DOUGLAS R. ..... p 3791 N93-32059
SMITH, J. ..... p 3730 N93-32306
SMITH, M. F. ..... p 3766 N93-31680
p 3735 N93-31790
SMITH, M. J. ..... p 3673 N93-31839
SMITH, THOMAS J. ..... p 3764 N93-32009
SMITH, TODD E. ..... p 3697 N93-31586
SMITH, WAYNE D. ..... p 3686 N93-32236
SMURLO, RICHARD P. ..... p 3799 N93-32078
SNAVELY, DEANNE ..... p 3704 N93-31919
SNELL, C. M. ..... p 3765 N93-32176
SNIDER, J. R. ..... p 3690 N93-32335
SNIEGOWSKI, J. ..... p 3730 N93-32306
SO, P. T. ..... p 3829 N93-32002
SOBCZYK, J. ..... p 3807 N93-31808
SOBIESZCZANSKI-SOBIESKI, J. p 3803 N93-31194
SOCKER, D. G. ..... p 3868 N93-31350
SOLANTAUSTA, YRJOE ..... p 3720 N93-31862
SOLDATENKO, G. A. ..... p 3706 N93-31660
SOLOMON, P. R. ..... p 3703 N93-31875
SOMMEIJER, B. P. ..... p 3810 N93-32394
p 3796 N93-32395
SOMMERHALDER, R. ..... p 3789 N93-31631
SOMMERHALDER, RUUD ..... p 3787 N93-31472
SOMOV, B. V. ..... p 3878 N93-31411
SOMOV, BORIS V. ..... p 3877 N93-31406
SON, G. ..... p 3723 N93-31210
SONG, KYU SEOK ..... p 3703 N93-31824
SONG, YONGKYU ..... p 3797 N93-31071
SONI, S. K. ..... p 3802 N93-31162
SONNEBORN, GEORGE ..... p 3861 N93-31737
SOPER, D. E. ..... p 3822 N93-32159
SORRENTI, DOMENICO ..... p 3806 N93-31544
SOSNIN, A. N. ..... p 3688 N93-31076
SPADARO, DANIELE ..... p 3870 N93-31363
SPEHLER, D. ..... p 3832 N93-32025
SPEIDEL, STEVE ..... p 3799 N93-31992
SPELIOTIS, DENNIS E. ..... p 3730 N93-31969
p 3841 N93-31976
SPENCER, SHELLY ANNE ..... p 3816 N93-32238
SPENCER, THOMAS ..... p 3726 N93-32014
SPERBER, K. R. ..... p 3766 N93-32297
SPEYER, J. J. ..... p 3782 N93-32267
SPLITT, GEORG ..... p 3717 N93-31861
SPRANGLE, PHILLIP ..... p 3732 N93-32019
SPRINKLE, DANNY R. ..... p 3729 N93-31297
SPUCKLER, CHARLES M. ..... p 3713 N93-32330
SRINIVAS, SAMPATH ..... p 3784 N93-32152
SRIVASTAVA, J. ..... p 3811 N93-32003
ST.CYR, O. CHRIS ..... p 3871 N93-31368
p 3871 N93-31369
STACHIOTTI, M. ..... p 3820 N93-31805
STAGNARO, MICHAEL J. ..... p 3784 N93-32107
STAHLBERG, GABRIELE ..... p 3776 N93-31237
STARING, ANTONIUS ADRIAAN MARIA
p 3831 N93-31621
STARKE, E. A., JR. ..... p 3705 N93-31643
STASIEWICZ, K. ..... p 3827 N93-31714
STAUFFER, ROBERT J. ..... p 3686 N93-32123
STAVROPOULOS, A. ..... p 3780 N93-32256
STEARNS, CHARLES R. ..... p 3763 N93-31902
STEBE, DORIS ..... p 3746 N93-31270
STEELE, COLIN D. C. ..... p 3873 N93-31381
STEFANELLI, RENATO ..... p 3797 N93-31255
STEFANOV, MICHAEL E. ..... p 3830 N93-32211
STEFFEN, C. J., JR. ..... p 3809 N93-32200
STEINBERGER, CRAIG J. ..... p 3728 N93-32371
STEINOLFSON, RICHARD S. ..... p 3853 N93-31681
STEINTHORSSON, ERLENDUR .. p 3723 N93-31147
STENVERS, K.-H. ..... p 3846 N93-31765
STEPANOV, E. ..... p 3740 N93-31490
STEPANOVA, TATIANA V. ..... p 3874 N93-31385
STEPHENS, D. R. ..... p 3700 N93-31334
STEPHENS, STUART K. ..... p 3866 N93-31959
STERN, R. ..... p 3868 N93-31348
STEVEN, GRANT P. ..... p 3742 N93-32331
STEVENS, JANET E. ..... p 3717 N93-32060
STEVENS, R. K. ..... p 3754 N93-32088
STEVENSON, DAVID J. ..... p 3866 N93-31959
STEWART, DAVID B. ..... p 3793 N93-32098
STICKLER, L. A. ..... p 3698 N93-32184
STIELER, BERNHARD ..... p 3677 N93-31281
p 3677 N93-31282
STIGTER, JURGEN ..... p 3787 N93-31472
STOKER, CAROL R. ..... p 3864 N93-31949
STONE, G. F. ..... p 3731 N93-31227
STONE, JAMES R. ..... p 3698 N93-31858
STONE, R. G. ..... p 3826 N93-31684
STONER, GLENN E. ..... p 3706 N93-31739
STOORVOGEL, A. A. ..... p 3796 N93-31525
STORM, WILLIAM F. ..... p 3782 N93-32264
p 3782 N93-32265
p 3782 N93-32268
STOSOWANEJ, SAMODZIELNA PRACOWNIA DYNAMIKI ..... p 3722 N93-32214
STOYCHEV, K. T. ..... p 3817 N93-31099
p 3827 N93-31100
STRACHAN, LEONARD ..... p 3871 N93-31367
STREET, KENNETH W., JR. ..... p 3709 N93-31316
STREIN, TIMOTHY G. ..... p 3721 N93-32001
STRIEGL, R. G. ..... p 3752 N93-31829
STRINGER, THOMAS A. ..... p 3791 N93-32034
STRIP, D. R. ..... p 3715 N93-32104
STRONG, KEITH T. ..... p 3874 N93-31388
p 3879 N93-31416
STROUSE, G. F. ..... p 3729 N93-31214
STRUCK, L. M. ..... p 3704 N93-31920
STUART, SUE-ANNE ..... p 3708 N93-31174
STUREK, WALTER B. ..... p 3726 N93-32028
SU, ZHAO-BIN ..... p 3831 N93-31509
SUESS, STEVEN T. ..... p 3869 N93-31356
p 3870 N93-31360
SUGENO, MICHIO ..... p 3688 N93-31442
SUICH, RONALD C. ..... p 3812 N93-31145
SUKSI, JUHANI ..... p 3821 N93-31863
SULLIVAN, R. ..... p 3866 N93-31960
SUMMANEN, T. ..... p 3878 N93-31412
SUMNER, A. ..... p 3858 N93-31708
SUN, HONG ..... p 3828 N93-31664
SUN, S. Z. ..... p 3732 N93-32180
SUO-ANTTILA, A. ..... p 3723 N93-31169
SUS, IRENE ..... p 3776 N93-31236
SUSA, M. ..... p 3705 N93-31322
SVENSSON, INDRA ..... p 3772 N93-32423
SWARTWOUT, GREGORY ..... p 3697 N93-31585
SWEERS, GUIDO ..... p 3807 N93-31654
SWENSON, HARRY N. ..... p 3678 N93-32225
SWIFT, C. T. ..... p 3747 N93-32362
SWIFT, R. P. ..... p 3765 N93-32176
SYKORA, JULIUS ..... p 3872 N93-31372
SYLWESTER, JANUSZ ..... p 3879 N93-31418
SZEGO, K. ..... p 3853 N93-31678
SZEMPLINSKA-STUPNICKA, WANDA
p 3722 N93-32214
SZYMURSKI, S. R. ..... p 3711 N93-32292

T

TAASAN, SHLOMO ..... p 3808 N93-31843
TAILLANDIER, D. ..... p 3778 N93-32244
TAKETA, Y. ..... p 3721 N93-32055
TAKIZAWA, N. ..... p 3672 N93-31189
TAL, ABRAHAM ..... p 3883 N93-31590
TALERO, E. ..... p 3842 N93-32167
TALVACCHIO, JOHN ..... p 3828 N93-31190
TANG, CHA-MEI ..... p 3732 N93-32021
TANG, DONG ..... p 3785 N93-32233
TAO, ZHIJIAN ..... p 3819 N93-31662
TARANENKO, P. I. ..... p 3688 N93-31076
TARASSENKO, L. ..... p 3785 N93-31054
TARBELL, T. ..... p 3867 N93-31345
TARTARINI, P. ..... p 3722 N93-31114
TASCH, A. ..... p 3830 N93-32183
TAYLOR, D. B. ..... p 3712 N93-31326
p 3713 N93-31327
TAYLOR, G. ..... p 3821 N93-32026
TAYLOR, J. K. ..... p 3699 N93-31830
TAYLOR, JOHNNY A. ..... p 3717 N93-31989
TEJADA, F. RIOS ..... p 3781 N93-32262
TEJEDA, MA DEL ROSARIO DURAN
p 3780 N93-32258
TELEGA, JOZEF JOACHIM ..... p 3742 N93-32321
TENDAM, A. A. ..... p 3802 N93-31128
p 3736 N93-32204
TERBEKKE, J. H. ..... p 3838 N93-31498
TERLAKY, T. ..... p 3790 N93-31659
TERSTEEGEN, J. ..... p 3676 N93-31280
TERSTEEGEN, JOHANNES ..... p 3719 N93-31462
TESAR, DELBERT ..... p 3737 N93-32125
TETZLAFF, JUERGEN ..... p 3677 N93-31284
THACKER, BEN H. ..... p 3694 N93-31563
p 3695 N93-31567
THART, W. G. J. ..... p 3701 N93-32202
THIBODEAUX, J. J. ..... p 3796 N93-32224
THIERSCHMANN, M. ..... p 3685 N93-31207
THOLEN, DAVID J. ..... p 3844 N93-31604
THOMAS, K. P. ..... p 3769 N93-31591
THOMAS, R. ..... p 3876 N93-31397
THOMAS, R. J. ..... p 3875 N93-31390
THOMAS, S. ..... p 3830 N93-32183
THOMPSON, A. ..... p 3856 N93-31699
THOMPSON, G. ..... p 3823 N93-31799
THOMPSON, J. A. ..... p 3858 N93-31708
THOMPSON, W. T. ..... p 3875 N93-31390

THORNE, A. P. p 3850 N93-31785
THORNTON, EARL A. p 3706 N93-31739
THORNTON, R. D. p 3735 N93-31727
p 3736 N93-32192
THORNTON, ROBERT p 3782 N93-32266
THUNNISSEN, H. A. M. p 3747 N93-32343
THURMAN, DOUGLAS R. p 3725 N93-31647
TING, ANTONIO p 3732 N93-32019
TING, LU p 3816 N93-31868
TIRABOSCHI, A. p 3808 N93-31820
TIT, N. p 3827 N93-31159
TITLE, A. p 3867 N93-31345
TIWARY, S. N. p 3820 N93-31822
TOERROENEN, MONA p 3752 N93-31853
TOGAI, MASAKI p 3688 N93-31441
TOLSTOY, V. N. p 3807 N93-31808
TOLZMAN, JEAN M. p 3837 N93-31217
TOPSOE, FLEMMING p 3837 N93-31221
TORSTI, JARMO p 3869 N93-31354
p 3879 N93-31415
TOTLAND, ERNST p 3671 N93-31052
TOUMA, H. p 3849 N93-31779
TOURETZKY, DAVID S. p 3777 N93-32064
TOVEY, S. p 3821 N93-32026
TOWNSEND, LAWRENCE W. p 3822 N93-32369
TRAHEY, N. M. p 3699 N93-31830
TREBES, J. E. p 3731 N93-31227
TREIMAN, A. H. p 3866 N93-31961
TRENTELMAN, H. L. p 3798 N93-31525
TREUMANN, R. A. p 3827 N93-31692
TREUMANN, RUDOLF p 3854 N93-31687
TRIANTAFILLOU, T. p 3735 N93-31727
TRIPATHI, RAM K. p 3822 N93-32369
TRIPATHY, S. p 3710 N93-31801
p 3710 N93-31802
TRIPATHY, S. K. p 3750 N93-32417
TROELSTRA, A. S. p 3804 N93-31482
TROFIMOV, V. N. p 3729 N93-31247
TRUBIAN, MARCO p 3792 N93-32346
TRUMPER, A. E. p 3815 N93-31806
TRYGG, K. p 3778 N93-32246
TSENG, SHIAO-MIN p 3849 N93-31778
TSO, K. p 3739 N93-32099
TSURUDA, K. p 3856 N93-31700
TU, C.-Y. p 3860 N93-31720
TUOMALA,B. p 3781 N93-32259
TURNBULL, A. p 3709 N93-31323
p 3700 N93-31736
TYAN, YUAN-SHENG p 3730 N93-31974
TZENG, JEROME T. p 3701 N93-32029

U

UHSE, W. p 3843 N93-31045
ULDER, N. L. J. p 3834 N93-31510
ULLMAN, M. A. p 3690 N93-32103
UMNIKOV, A. Y. p 3820 N93-31821
UNG, K.-C. p 3809 N93-32170
URBANI, L. p 3775 N93-32252
URBANI, LUCA p 3779 N93-32248
UUTTU, TERO p 3702 N93-32388

V

VAJTA, M. p 3735 N93-31526
VALLER, DAVID A., JR. p 3768 N93-32051
VALTONEN, E. p 3869 N93-31354
VANBENTHEM, JOHAN p 3788 N93-31532
VANDAMME, R. M. J. p 3716 N93-31516
VANDAMME, RUUD M. J. p 3804 N93-31467
VANDELEIJGRAAF, R. p 3678 N93-32337
VANDENBERG, MARTIN p 3787 N93-31478
VANDENBERG, PAUL HENDRIK JACOB
p 3709 N93-31541
VANDENBOSCH, P. p 3781 N93-32260
VANDENNEHEUVEL, SIEGER p 3788 N93-31529
VANDENOORD, G. H. J. p 3853 N93-31679
VANDERAAR, M. p 3717 N93-31856
VANDERBURG, J. W. p 3725 N93-31527
VANDERBURGH, A. H. P. p 3815 N93-31653
VANDERDONCK, JACQUES COR JOHAN
p 3703 N93-31622
VANDERHOFF, JOHN A. p 3713 N93-32030
VANDERHOUWEN, P. J. p 3810 N93-32394
p 3797 N93-32396
VANDERLINDEN, RONALD A. M. p 3876 N93-31400
VANDERPOEL, W. L. p 3805 N93-31499
p 3805 N93-31500
VANDERSCHAAF, TJERK WOUTHERUS
p 3714 N93-31539
VANDERSPEK, ALEXANDER MICHAEL
p 3703 N93-31630
VANDERWALL, BEREND p 3672 N93-31320
VANDERWEERD, P. R. p 3789 N93-31631
VANDERWEERD, PAUL p 3787 N93-31472
VANDERWOUDE, J. W. p 3805 N93-31487
p 3805 N93-31492
p 3789 N93-31614
VANDOORN, E. A. p 3812 N93-32392
VANDOORN, ERIK A. p 3806 N93-31515
VANDRONKELAAR, JAN-HEIN p 3680 N93-32416
VANEMDEBOAS, PETER p 3788 N93-31528
VANERP-BAART, A, M. J. p 3778 N93-32241
VANGILS, S. A. p 3807 N93-31627
VANHORSSEN, WIM T. p 3805 N93-31501
VANHOVEN, GERARD p 3875 N93-31391
VANKEULEN, BERT A. M. p 3799 N93-31628
VANKLEIJ, REINIER p 3788 N93-31548
VANLAARHOVEN, P. J. M. p 3834 N93-31510
VANLEEUWEN, STORM p 3678 N93-32337
VANLOON, M. p 3756 N93-32393
VANO, JOSE IGNACIO PERALBA p 3778 N93-32247
VANRIJN, AFKE p 3787 N93-31472
VANROSENDALE, JOHN p 3793 N93-32359
VANSHOONEVELD, D. p 3790 N93-31656
VANWALSUM, THEO p 3724 N93-31494
p 3788 N93-31495
VANWOERKOM, P. T. L. M. p 3737 N93-32333
VASTESAEGER, J.-P. p 3781 N93-32260
VAUGHAN, C. T. p 3786 N93-31183
VAUGHAN, P. A. p 3843 N93-31713
VAVILOV, S. A. p 3740 N93-31490
p 3814 N93-31633
VAWTER, G. A. p 3732 N93-32180
VAZ, J., JR. p 3821 N93-31907
p 3832 N93-31908
VAZAN, FRIDRICH p 3730 N93-31974
VAZQUEZ, JUAN M. MORENO p 3780 N93-32258
VEGTER, GERT p 3807 N93-31623
VELDMAN, H. J. p 3810 N93-32398
p 3810 N93-32401
VENTURA, R. p 3870 N93-31363
VENTURA, S. C. p 3702 N93-31209
VERDEYEN, J. T. p 3718 N93-32425
VERMEULEN, J. P. p 3672 N93-31538
VERRILLI, M. J. p 3696 N93-31579
VERSTRAELEN, P. J. T. p 3747 N93-32344
VESCIO, N. p 3754 N93-32088
VESCOVO, ELIO p 3719 N93-31253
VIAL, J.-P. p 3790 N93-31659
VIAL, JEAN-CLAUDE p 3874 N93-31382
p 3875 N93-31389
VIDONI, THOMAS J. p 3728 N93-32371
VILSMEIER, JOSEF WALTER p 3679 N93-31058
VIROLAINEN, KIMMO p 3714 N93-31545
VISSCHER, C. p 3747 N93-32343
VITEK, J. M. p 3727 N93-32303
VLASOV, A. A. p 3823 N93-31090
VOELLMER, GEORGE M. p 3734 N93-31317
VOGEL, C. M. p 3754 N93-32089
VOGEL, JAMES A. p 3773 N93-31917
VOI, D. L. p 3819 N93-31244
VOIGT, W. p 3872 N93-31370
VONDERLUEHE, O. p 3846 N93-31763
p 3847 N93-31769
VONENTRESS-FUERSTENECK, LUTZ
p 3687 N93-31593
VONSTEIGER, R. p 3878 N93-31409
VOSS, RALPH p 3671 N93-31171
VRBSKY, SUSAN V. p 3843 N93-32150
VUIK, C. p 3724 N93-31484
p 3728 N93-32397

W

WACKER, J. F. p 3732 N93-32304
WADDINGTON, EDWIN D. p 3759 N93-31883
WAENKE, H. p 3862 N93-31941
WAGNER, DANIEL R. p 3781 N93-32263
WAGNER, P. p 3717 N93-31856
WAGNER, W. J. p 3880 N93-31424
WAHL, D. C. p 3834 N93-31431
WAITE, J. H., JR. p 3858 N93-31710
WALDSTREICHER, J. S. p 3767 N93-31329
WALJESKI, KATRINA p 3877 N93-31403
WALKER, S. N. p 3858 N93-31709
p 3859 N93-31715
WALSH, S. J. p 3742 N93-32340
WANG, A. H. p 3870 N93-31363
WANG, A.-H. p 3870 N93-31360
WANG, REN-HONG p 3804 N93-31467
WANG, WEI p 3803 N93-31303
WANG, Y. p 3826 N93-31998
WANHILL, R. J. H. p 3681 N93-31742
WANSING, HEINRICH p 3806 N93-31533
WARK, S. J. p 3818 N93-31228
p 3823 N93-31246
WARNOCK, TED WESLEY p 3687 N93-31069
WASBERG, CARL ERIK p 3807 N93-31598
WATANABE, I. p 3813 N93-31166
WATSON, KENNETH M. p 3769 N93-32171
p 3771 N93-32320
WATSON, R. W. p 3795 N93-31985
WAWNER, FRANKLIN E., JR. p 3706 N93-31739
WECHSLER, HARRY p 3800 N93-32169
WEEGELS, LEO MARIE p 3828 N93-31619
WEEKES, T. C. p 3851 N93-32160
WEIDNER, GEORGE A. p 3763 N93-31902
WEIGELT, G. p 3846 N93-31764
p 3850 N93-31786
WEINACHT, PAUL p 3726 N93-32028
WEINER, A. M. p 3829 N93-31988
WEIR, NICHOLAS p 3843 N93-32143
WEISER, P. S. p 3708 N93-31174
WEISS, JONATHAN p 3688 N93-31443
WEITSMAN, Y. J. p 3701 N93-32067
WEIZER, V. G. p 3750 N93-32201
WERT, JOHN A. p 3706 N93-31739
WESSELING, P. p 3724 N93-31496
p 3725 N93-31547
p 3725 N93-31634
p 3725 N93-31657
p 3726 N93-31658
WESSELS, H. R. A. p 3767 N93-31600
WEST, E. A. p 3824 N93-32378
WESTBY, M. F. p 3724 N93-31336
WESTERSTAAHL, DAG p 3806 N93-31534
WETZEL, TODD A. p 3690 N93-32381
WEY, C. p 3673 N93-31839
WHARTON, W. R., JR. p 3691 N93-31185
WHINNERY, R. p 3736 N93-32086
WHITE, J. p 3709 N93-31323
WHITE, J. M. p 3842 N93-32298
WHITE, STEPHEN M. p 3874 N93-31387
WHITEBREAD, KENNETH R. p 3794 N93-32141
WHITEHEAD, C. A. p 3732 N93-32304
WHITEHEAD, M. p 3823 N93-31799
WIBBERENZ, G. p 3854 N93-31686
WIDOM, JENNIFER p 3811 N93-31464
p 3787 N93-31466
WIDROW, L. M. p 3822 N93-32294
WIGNALL, J. W. G. p 3815 N93-32410
p 3833 N93-32411
WILBURN, A. M. p 3770 N93-31832
WILCOX, BRIAN p 3737 N93-32115
p 3737 N93-32120
WILCOX, DAVID C. p 3727 N93-32329
WILD, CHRISTIAN J. p 3790 N93-31738
WILFINGER, LEE S. p 3789 N93-31638
WILHELM, K. p 3867 N93-31346
WILKEN, B. p 3856 N93-31701
p 3857 N93-31706
WILKINSON, CHRIS p 3681 N93-31743
WILL, HERBERT p 3693 N93-31554
WILLIAMS, ELIZABETH p 3841 N93-31977
WILLIAMS, J. S. p 3765 N93-32191
WILLIAMS, R. L. p 3715 N93-31867
WILLIAMS, T. T. p 3819 N93-31335
WILLS, ROBERT W. p 3796 N93-32213
WILSEY, MARK S. p 3685 N93-32319
WILSON, C. L. p 3797 N93-31332
WILSON, JACK p 3683 N93-32368
WILSON, JOHN W. p 3822 N93-32369
WILSON, W. E. p 3756 N93-32188
WING, JEANNETTE M. p 3841 N93-32048
p 3791 N93-32066
WINTERSCHEIDT, DANIEL L. p 3727 N93-32370
WITHERS, JAMES C. p 3707 N93-32318
WITTE, LARRY C. p 3709 N93-31636
WITTE, M. p 3856 N93-31699
WITTEVEEN, CEES p 3790 N93-31852
WOLTER, F. E. p 3786 N93-31199
WOLVERTON, DAVID A. p 3680 N93-32218
WON, D. Y. p 3720 N93-31825
WONG, GRANT SURE-MAN p 3683 N93-31068
WOODWARD, ROBERT H. p 3770 N93-31859
WOOLLISCROFT, L. J. p 3843 N93-31713
WOOLLISCROFT, L. J. C. p 3858 N93-31708
p 3858 N93-31709
p 3859 N93-31715
WORMLEY, D. N. p 3736 N93-32192
WRIGHT, I. P. p 3867 N93-31962
WU, C. C. p 3854 N93-31685
WU, CHIN-CHUN p 3860 N93-31723
WU, S. T. p 3870 N93-31360
p 3870 N93-31363
p 3854 N93-31685
p 3860 N93-31723
WU, Y.-T. p 3694 N93-31563
p 3695 N93-31569

X

XU, GEORGE ZHEQUN p 3688 N93-31157

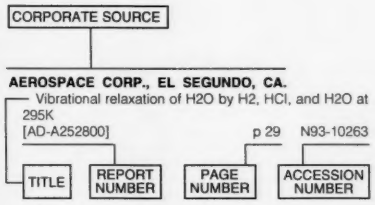
Y

YAGEL, RONI ..... p 3792 N93-32322
YAMADA, Y. ..... p 3828 N93-31176
YAMAMOTO, Y. ..... p 3692 N93-31310
YAMASAKI, M. C. R. ..... p 3708 N93-31179
YANG, D. ..... p 3752 N93-31831
YANG, SHELBY XIAOBING ..... p 3852 N93-31153
YANG, SHIN NAN ..... p 3817 N93-31059
YANG, YAN ..... p 3671 N93-32232
YANISHEVSKY, MARKO ..... p 3681 N93-31744
YAO, CHUNG-SHENG ..... p 3673 N93-31732
YATES, JOHN T., JR. ..... p 3710 N93-32010
YEAGER, NANCY ..... p 3841 N93-31978
YEARBY, K. H. ..... p 3858 N93-31708
YEE, SINCLAIR ..... p 3824 N93-32050
YEH, EUENG-NAN ..... p 3771 N93-32360
YERMOLAEV, Y. I. ..... p 3857 N93-31705
YERMOLAEV, YURI I. ..... p 3879 N93-31414
YEVICH, S. D. HART ..... p 3778 N93-32242
YEVICH, S. J. ..... p 3778 N93-32242
YINON, JEHUDA ..... p 3713 N93-32077
YIP, LONG P. ..... p 3673 N93-31732
YOCUM, A. M. ..... p 3726 N93-32071
YOSHIDA, R. ..... p 3728 N93-31117
YOUNG, STEVEN D. ..... p 3796 N93-32213
YU, NIANN-I ..... p 3699 N93-31143
YU, S. H. ..... p 3736 N93-32192
YUKHIMUK, A. K. ..... p 3860 N93-31724
YUKHIMUK, V. A. ..... p 3860 N93-31724
YUN, HEE MANN ..... p 3712 N93-32382
YUST, C. S. ..... p 3736 N93-32179

Z

ZACCARIA, M. ..... p 3698 N93-31588
ZACHARIA, T. ..... p 3727 N93-32303
ZAFIRAKOU, A. ..... p 3756 N93-32189
ZAKLAD, ALLEN L. ..... p 3777 N93-32012
ZAMAN, K. B. M. Q. ..... p 3672 N93-31648
ZANDBERGERN, P. J. ..... p 3725 N93-31527
ZEGELING, ANDRE ..... p 3805 N93-31505
ZELENKA, M. P. ..... p 3756 N93-32188
ZENG, S. ..... p 3725 N93-31547
p 3725 N93-31634
p 3726 N93-31658
ZENT, A. P. ..... p 3867 N93-31963
ZHANG, HONG ..... p 3808 N93-31843
ZHANG, WEITAO ..... p 3809 N93-32285
ZHANG, XIN ..... p 3771 N93-32215
ZHANG, ZHENDA ..... p 3873 N93-31379
ZHAO, PEI-QIAN ..... p 3824 N93-31784
ZHAO, XUE-PU ..... p 3871 N93-31366
ZHOU, P. ..... p 3732 N93-32180
ZHU, L.-Y. ..... p 3704 N93-31918
ZHU, N. ..... p 3846 N93-31763
ZICARI, ROBERTO ..... p 3787 N93-31252
ZIEGLER, VOLKER ..... p 3716 N93-31342
ZIELINSKI, ALEXANDER E. ..... p 3687 N93-32074
ZIEMIANSKI, JOSEPH A. ..... p 3682 N93-32351
ZIMA, HANS ..... p 3792 N93-32323
ZIMERMAN, A. H. ..... p 3808 N93-31819
p 3808 N93-31912
ZIMMERMAN, WAYNE ..... p 3801 N93-32100
ZISSERMAN, A. ..... p 3785 N93-31055
p 3785 N93-31151
ZOCCHI, F. E. ..... p 3720 N93-31609
ZOGA, T. ..... p 3780 N93-32256
ZOLPER, J. ..... p 3732 N93-32180
ZUMBRO, J. D. ..... p 3822 N93-32300

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The accession number denotes the number by which the citation is identified. The page number helps you locate the citation in the abstract section. The titles are arranged under each corporate source in ascending accession number order.

A

ACADEMY OF SCIENCES OF THE UKRAINE, KIEV.
Pion multiplicity as a probe of the deconfinement transition in heavy-ion collisions
[DE93-608484] p 3817 N93-31059
Non-standard representations of the space-time groups and their applications to the dynamical theory of elementary particles
[DE93-608203] p 3818 N93-31240
Nonlinear Pomeron and Odderon in elastic re-scatterings
[DE93-608326] p 3818 N93-31241
Supercritical pomeron and spin effects in meson-nucleon scattering at high energy
[DE93-608327] p 3818 N93-31242
Odderon dominance in dipole model of hadron elastic scattering
[DE93-608329] p 3819 N93-31243
Three-neutrino oscillations in matter and topological phases
[DE93-608386] p 3813 N93-31290
Electron-microscopic investigations of irradiated and naturally aged aluminum alloy
[DE93-606752] p 3706 N93-31660
Differential equations method: The calculation of N (N greater than 2)-points diagrams
[DE93-609887] p 3814 N93-32412

ACADEMY OF SCIENCES OF THE UKRAINE, LVOV.
Role of the INTERBALL small scale investigations in the GGS program p 3859 N93-31717

ACADEMY OF SCIENCES (USSR), MOSCOW.
A numerical model of interaction of coronal transients with the solar wind p 3874 N93-31385
Solar wind heavy ions and proton/alpha particle relations observed onboard the Prognoz 7 satellite p 3879 N93-31414
Energetics of ULF/ELF plasma waves in the solar wind and outer Earth's magnetosphere p 3826 N93-31689
ULF/ELF electromagnetic waves associated with the quasiperpendicular Earth's bow shock crossings p 3827 N93-31690
Mass, momentum and energy transport from the Sun to the Earth by different types of the solar wind: Prognoz 7 observations p 3857 N93-31705
Role of the INTERBALL small scale investigations in the GGS program p 3859 N93-31717
CELIAS: Charge, Element and Isotope Analysis System for the SOHO mission p 3860 N93-31725
P Cyg envelope and prospects of interferometric observations p 3848 N93-31777

ACADEMY OF SCIENCES (USSR), NOVOSIBIRSK.
Low aperture magnetic elements measurements
[DE93-605897] p 3814 N93-31088

ACADEMY OF SCIENCES (USSR), TROITSK.
Eclipse observations of the outer solar corona and the SOHO mission p 3872 N93-31371

ACUREX CORP., MOUNTAIN VIEW, CA.
LNG as a fuel for railroads: Assessment of technology status and economics
[PB93-188787] p 3713 N93-31434

ADVANCED DECISION SYSTEMS, MOUNTAIN VIEW, CA.
Decision theory for computing variable and value ordering decisions for scheduling problems p 3835 N93-32137

ADVANCED DEVELOPMENT CORP., BURLINGTON, MA.
Data storage: Retrospective and prospective p 3841 N93-31976

ADVANCED FUEL RESEARCH, INC., EAST HARTFORD, CT.
Advanced infrared spectroscopy for improved characterization of chemical systems
[PB93-174977] p 3703 N93-31875

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, NEUILLY-SUR-SEINE (FRANCE).
The Impact of Changing International Relations on the Scientific and Technical Community
[AGARD-CP-523] p 3836 N93-31215
AGARD Engine Disc Cooperative Test Programme
[AGARD-R-766-ADD] p 3681 N93-31741
Nutrition, Metabolic Disorders and Lifestyle of Aircrew
[AGARD-CP-533] p 3777 N93-32240

AERONAUTICAL RESEARCH INST. OF SWEDEN, STOCKHOLM.
Modal measurements and propeller field excitation on acoustic full scale mockup of SAAB 340 aircraft
[FFA-TN-1992-08] p 3815 N93-31051
GARTEUR 3D sheer layer experiment
[FFA-TN-1992-26] p 3671 N93-31052
Modal synthesis technique used in shallow doublewall
[FFA-TN-1992-29] p 3722 N93-31053
Optimal design and imperfection sensitivity of nonlinear shell structures
[FFA-TN-1992-30] p 3739 N93-31123
WBNFLOW: Multi-grid/multi-block potential solver for compressible flow. User's guide
[FFA-TN-1992-43] p 3723 N93-31146

AEROSPACE CORP., EL SEGUNDO, CA.
Flammability and explosion limits of H2 and H2/CO: A literature review
[AD-A264896] p 3702 N93-31064

AGENCY OF INDUSTRIAL SCIENCE AND TECHNOLOGY, TOKYO (JAPAN).
Japan's Sunshine Project
[DE93-768309] p 3748 N93-31811
Japan's Sunshine Project
[DE93-768157] p 3749 N93-32041
Japan's Sunshine Project
[DE93-768166] p 3749 N93-32042
Japan's Sunshine Project
[DE93-768249] p 3749 N93-32053
Japan's Sunshine Project
[DE93-768268] p 3749 N93-32054

AIR-CONDITIONING AND REFRIGERATION TECHNOLOGY INST., INC., ARLINGTON, VA.
Materials compatibility and lubricants research on CFC-refrigerant substitutes
[DE93-014770] p 3711 N93-32292
Solubility, viscosity and density of refrigerant/lubricant mixtures
[DE93-014771] p 3711 N93-32293

AIR FORCE CIVIL ENGINEERING CENTER, TYNDALL AFB, FL.
Air Force construction automation/robotics p 3715 N93-32110
Fire protection for launch facilities using machine vision fire detection p 3687 N93-32113

AIR FORCE GEOPHYSICS LAB., SUNSPOT, NM.
Ground-based coronagraphic observations of solar streamers p 3870 N93-31358

AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OH.
Determination of the robustness of passive microwave measurements and derivative parameters for use in precipitation discrimination over land
[AD-A265492] p 3768 N93-32008
An analysis of the composition of auroral emissions in the near infrared
[AD-A265493] p 3764 N93-32009
Microinstabilities in high-power MPD systems: Preliminary diagnostics
[AD-A265415] p 3826 N93-32047
Wind profiling in a cloudy convective atmospheric boundary layer over land
[AD-A265422] p 3768 N93-32051
Evolution of area-averaged vertical velocity in the convective region of a midlatitude squall line
[AD-A265333] p 3768 N93-32063

AIR FORCE SYSTEMS COMMAND, BROOKS AFB, TX.
A preliminary empirical evaluation of virtual reality as an instructional medium for visual-spatial tasks p 3784 N93-32151
Nutrition for a typical MAC crew during Desert Storm p 3778 N93-32245
The lifestyle and dietary consumption patterns of United States Air Force aviators within air training command at Randolph Air Force Base, Texas p 3780 N93-32257
The influence of dietary counseling and cardiac catheterization on lipid profiles in American military aviators p 3781 N93-32259
Subjective mood and fatigue of C-141 crew during Desert Storm p 3782 N93-32264
C-141 aircrew sleep and fatigue during the Persian Gulf conflict p 3782 N93-32265
Digital flight data as a measure of pilot performance associated with fatigue from continuous operations during the Persian Gulf conflict p 3782 N93-32268

AIR FORCE SYSTEMS COMMAND, GRIFFISS AFB, NY.
Advanced Artificial Intelligence Technology Testbed p 3801 N93-32126
Knowledge-based simulation using object-oriented programming p 3794 N93-32127
Crisis action planning and replanning using SIPE-2 p 3835 N93-32131
Combining qualitative and quantitative spatial and temporal information in a hierarchical structure: Approximate reasoning for plan execution monitoring p 3835 N93-32132
The Knowledge-Based Software Assistant: Beyond CASE p 3794 N93-32156
ARIES: Acquisition of Requirements and Incremental Evolution of Specifications p 3794 N93-32157
The enhanced Software Life Cyle Support Environment (ProSLCSE): Automation for enterprise and process modeling p 3794 N93-32158

AIR FORCE SYSTEMS COMMAND, KELLY AFB, TX.
RACE pulls for shared control p 3686 N93-32122

AIR FORCE SYSTEMS COMMAND, WRIGHT-PATTERSON AFB, OH.
Air Force research in human sensory feedback for telepresence p 3801 N93-32109
Automated Assembly Center (AAC) p 3686 N93-32123

ALABAMA UNIV., HUNTSVILLE.
Effects of hydrogen and electron diffusion on trace species diffusion in the solar atmosphere p 3878 N93-31413
Software to model AXAF image quality
[NASA-CR-192574] p 3789 N93-31637

Three-dimensional numerical simulation of interplanetary magnetic field changes at 1 AU as a consequence of simulated solar flares
p 3860 N93-31723

Enhancements to the Engine Data Interpretation System (EDIS)
[NASA-CR-193363] p 3800 N93-32230

Refine research plan for use of Atlas data
[NASA-CR-192611] p 3766 N93-32349

ALASKA UNIV., FAIRBANKS.

The role of the margins in ice stream dynamics
p 3761 N93-31896

A study of the magnetic field annihilation process in the magnetosphere and some geotechnical applications
[DE93-013172] p 3765 N93-32164

ALCALA DE HENARES UNIV., MADRID (SPAIN).

Calibration of a detector system for solar energetic particles analysis p 3860 N93-31721

ALCATEL ESPACE, TOULOUSE (FRANCE).

Synthesis and realization of a monolithic active bandpass filter for the Ku band
[LAAS-92365] p 3719 N93-31173

Digital processing for positioning with one satellite
[ETN-93-93732] p 3685 N93-31318

AMBASSADOR COLL., BIG SANDY, TX.

Protocols for distributive scheduling
p 3835 N93-32129

AMERICAN SOLAR ENERGY SOCIETY, BOULDER, CO.

The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 2, part 1
[PB93-174787] p 3748 N93-31070

The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 3, part 1
[PB93-174803] p 3748 N93-31104

The 1991 Solar World Congress: Proceedings of the Biennial Congress of the International Solar Energy Society, volume 3, part 2
[PB93-174811] p 3748 N93-31105

AMSTERDAM UNIV. (NETHERLANDS).

Neural nets and their relevance for information retrieval
[CL-91-02] p 3798 N93-31469

A formal discourse grammar tackling verb phrase anaphora
[CL-91-03] p 3787 N93-31478

Reasoning about termination of PROLOG programs
[CT-91-12] p 3787 N93-31479

Undecidability of modal and intermediate first-order logics with two individual variables
[ML-92-06] p 3804 N93-31480

Information systems as coalgebras
[ML-92-08] p 3838 N93-31481

Realizability
[ML-92-09] p 3804 N93-31482

Kohonen feature maps in natural language processing
[CL-91-01] p 3788 N93-31517

Object oriented application flow graphs and their semantics
[CT-92-01] p 3788 N93-31528

Weak equivalence: Theory and applications
[CT-92-02] p 3788 N93-31529

A new definition of SLDNF-resolution
[CT-92-03] p 3806 N93-31530

Meeting some neighbours: A dynamic modal logic meets theories of change and knowledge representation
[LP-92-10] p 3806 N93-31531

A note on dynamic arrow logic
[LP-92-11] p 3788 N93-31532

Sequent calculi for normal modal propositional logics
[LP-92-12] p 3806 N93-31533

Iterated quantifiers
[LP-92-13] p 3806 N93-31534

ANALYTIC POWER CORP., BOSTON, MA.

Electropneumatic actuator, phase 1
[PB93-174951] p 3720 N93-31876

ANALYTICS, INC., WILLOW GROVE, PA.

Application and validation of workload assessment techniques
[AD-A264575] p 3777 N93-32012

AOTF TECHNOLOGY, INC., SUNNYVALE, CA.

AOTF enhancements for a space-based spectropolarimeter
[NASA-CR-193290] p 3691 N93-31040

APT, INC., SAN DIEGO, CA.

Overview of Fuzzy Logic p 3688 N93-31445

ARGONNE NATIONAL LAB., IL.

Preliminary results of an experimental study of the interactions of basalt glass and a water vapor atmosphere: Implications for weathering on Mars
p 3864 N93-31948

ARIZONA STATE UNIV., TEMPE.

Weathering processes implied from analysis of small Martian avalanche chutes p 3866 N93-31960

Effect of sound on boundary layer stability
[NASA-CR-193367] p 3816 N93-32238

ARIZONA UNIV., TUCSON.

CELIAS: Charge, Element and Isotope Analysis System for the SOHO mission p 3860 N93-31725

An unusual spectral unit in West Candor Chasma: Evidence for hydrothermal or aqueous alteration?
p 3863 N93-31942

ARKANSAS COLL., BATESVILLE.

Effect of purity on adsorption capacities of a Mars-like clay mineral at different pressures p 3863 N93-31945

ARMY AEROMEDICAL RESEARCH LAB., FORT RUCKER, AL.

The effects of cockpit heat on aviator sleep parameters p 3782 N93-32266

ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER, WATERVLIET, NY.

Benet improvements made on Los Alamos electromagnetic field code
[AD-A265474] p 3718 N93-32065

ARMY AVIATION SYSTEMS COMMAND, CLEVELAND, OH.

Axial and torsional fatigue behavior of a cobalt-base alloy p 3697 N93-31582

ARMY NATICK RESEARCH AND DEVELOPMENT COMMAND, MA.

The effects of an antijet lag diet p 3781 N93-32263

Effects of caffeine on mental performance and mood: Implications for aircrew members p 3783 N93-32269

ARMY RESEARCH INST. OF ENVIRONMENTAL MEDICINE, NATICK, MA.

An annotated bibliography of research involving women, conducted at the US Army Research Institute of Environmental Medicine
[AD-A265497] p 3773 N93-31917

ARMY RESEARCH LAB., ABERDEEN PROVING GROUND, MD.

Numerical simulation of the flow in a 1:57-scale axisymmetric model of a large blast simulator
[AD-A265551] p 3685 N93-31916

Navier-Stokes computations for kinetic energy projectiles in steady coning motion: A predictive capability for pitch damping
[AD-A264111] p 3726 N93-32028

A thermoelastic model for thick composite rings
[AD-A264112] p 3701 N93-32029

A summary of the JANNAF Workshop on Methods for Exchange of Gun Propellant Burning Rate Information
[AD-A264113] p 3713 N93-32030

Technique for measuring the spin rate of kinetic energy projectiles
[AD-A264114] p 3717 N93-32031

A survey of codes for modeling electromagnetic launch
[AD-A264946] p 3687 N93-32074

ARMY RESEARCH LAB., WHITE SANDS MISSLE RANGE, NM.

An acoustic scattering code
[AD-A265863] p 3816 N93-32316

ARMY WAR COLL., CARLISLE BARRACKS, PA.

The Army and military in space
[AD-A264581] p 3812 N93-32013

ASTROPHYSICAL INST., POTSDAM (GERMANY).

On Short Large Amplitude Magnetic Structures in the vicinity of the quasi-parallel region of the Earth's bow shock p 3854 N93-31688

ATOMIC ENERGY COMMISSION, DAMASCUS (SYRIA).

High temperature superconductivity: Concept, preparation and testing of high T(sub c) superconductor compounds and applications
[DE93-608696] p 3827 N93-31077

AUBURN UNIV., AL.

A method to predict the orbital lifetimes of free tethers and tether-trailing satellites using artificial neural networks p 3687 N93-31069

Assessment of a human computer interface prototyping environment
[NASA-CR-192612] p 3784 N93-31849

AUSTRALIAN INST. OF NUCLEAR SCIENCE AND ENGINEERING, LUCAS HEIGHTS.

The Thirteenth AINSE Radiation Biology Conference: Conference handbook
[DE93-609131] p 3773 N93-31225

B

BATTELLE COLUMBUS LABS., RESEARCH TRIANGLE PARK, NC.

Selection of personnel for stressful occupations: The potential utility of psychophysiological measures as selection tools
[AD-A264571] p 3776 N93-32011

BATTELLE COLUMBUS LABS., OH.

In-situ bioventing: Two US EPA and Air Force sponsored field studies
[PB93-194231] p 3754 N93-32089

BELEIDSCOMMISSIE REMOTE SENSING, DELFT (NETHERLANDS).

Vegetation mapping for environment management and monitoring
[ETN-93-93466] p 3747 N93-32342

Satellite pictures: An efficient aid for information about land use
[ETN-93-93467] p 3747 N93-32343

Remote sensing: A powerful aid for the analysis of problems in the north Holland Vechtstreek
[ETN-93-93468] p 3747 N93-32344

A new view of the sea
[ETN-93-93469] p 3747 N93-32345

BELGIAN AIR FORCE, BRUSSELS.

Biological parameters and cardiovascular risk factors with the flying personnel of the Belgian Armed Forces
p 3781 N93-32260

BELGIAN ROYAL OBSERVATORY, BRUSSELS.

The July 11, 1991 solar corona observed in polarized white light: Preliminary results p 3879 N93-31417

BELL HELICOPTER CO., FORT WORTH, TX.

Civil tiltrotor transport point design: Model 940A
[NASA-CR-191446] p 3701 N93-32234

BEN GURION UNIV. OF THE NEGEV, BEERSHEVA (ISRAEL).

Possible manifestation of the critical ionization velocity phenomenon in the solar corona p 3861 N93-31726

BENTLY ROTOR DYNAMICS RESEARCH CORP., MINDEN, NV.

One lateral mode isotropic rotor response to nonsynchronous excitation p 3738 N93-32276

Perturbation technique for identification of the lowest modes of rotors with fluid interaction
p 3738 N93-32277

Vibrational diagnostics of rotating machinery malfunctions p 3738 N93-32278

BERN UNIV. (SWITZERLAND).

Solar wind abundances from Ulysses
p 3878 N93-31409

Interaction of solar wind ions with thin carbon foils: Calibration of time-of-flight spectrometers
p 3880 N93-31423

BIRMINGHAM UNIV. (ENGLAND).

Multi-thermal emission associated with a limb prominence following two subflares and a coronal mass ejection p 3876 N93-31399

BOSTON UNIV., MA.

The effects of magnetic storm phases on F-layer irregularities from auroral to equatorial latitudes
[AD-A264908] p 3764 N93-32094

BOWLING GREEN STATE UNIV., OH.

Vibrational overtone spectroscopy of cyclic amines: Pyridine and related compounds
[AD-A265524] p 3704 N93-31919

BRIGHAM YOUNG UNIV., PROVO, UT.

The effect of alkyl substituents on the macrocycle ring on enantiomeric recognition by chiral pyridino-18-crown-6 for 1-naphthylethylamine
[AD-A265513] p 3704 N93-31918

BROOKHAVEN NATIONAL LAB., UPTON, NY.

Adaptive optics for high power beam lines using diamond crystal monochromators
[DE93-009328] p 3824 N93-31987

BROWN UNIV., PROVIDENCE, RI.

Effects of the chemical environment on the spectroscopic properties of clays: Applications for Mars
p 3862 N93-31936

Systematic variations in the spectral properties of bright regions on Mars p 3864 N93-31951

Composition of weakly altered Martian crust: Clues from imaging spectroscopy p 3865 N93-31952

Using the Viking biology experimental results to obtain chemical information about Martian regolith
p 3865 N93-31955

A soft-competitive splitting rule for adaptive tree-structured neural networks
[AD-A264936] p 3799 N93-32073

BUREAU OF MINES, AMARILLO, TX.

Helium resources of the United States, 1991
[PB93-189652] p 3743 N93-31116

Simple and accurate method for calculating viscosity of gaseous mixtures
[PB93-189751] p 3702 N93-31198

BUREAU OF MINES, DENVER, CO.

Availability of platinum and platinum-group metals
[PB93-189496] p 3743 N93-31115

BUSEK (J.) CO., INC., NEEDHAM, MA.

A high thrust density, C60 cluster, ion thruster
[AD-A264405] p 3691 N93-31188

C

CALIFORNIA INST. OF TECH., PASADENA.
Basal hydraulic conditions of Ice Stream B p 3762 N93-31898
Experimental investigation of carbonate formation on Mars p 3866 N93-31959
CALIFORNIA POLYTECHNIC STATE UNIV., SAN LUIS OBISPO.
Comparison of straight and 15 degree vectored nozzles using a six component thrust stand [NASA-CR-193291] p 3725 N93-31641
Effects of an aft facing step on the surface of a laminar flow glider wing [NASA-CR-193302] p 3673 N93-31855
CALIFORNIA UNIV., BERKELEY.
Observations of the quiet Sun from the soft x ray telescope on Yohkoh p 3874 N93-31388
Striped tape arrays p 3730 N93-31970
Conference: Three Decades of Numerical Linear Algebra at Berkeley [AD-A264964] p 3809 N93-32076
CALIFORNIA UNIV., IRVINE.
Dynamic formation and magnetic support of loop or arcade prominences p 3875 N93-31391
CALIFORNIA UNIV., LOS ANGELES.
Compressive strengths of fiber-reinforced composites with interface debonding p 3699 N93-31136
Eddy vortices produced by nonlinear reflection of a gravity wave at a critical level p 3757 N93-31155
Enhancement of single phase forced convection heat transfer in tubes and ducts using tangential flow injection [PB93-189975] p 3723 N93-31210
Precipitation hardening of infrared transmitting ZnS ceramics [AD-A265184] p 3710 N93-31993
Optimal control problems for parabolic boundary control systems p 3800 N93-32216
CALIFORNIA UNIV., SAN DIEGO.
Overall properties of composite materials: A general model based on periodic microstructure p 3699 N93-31143
A study of capillary and capillary-gravity wind waves: Their structures, distributions, and energy balances p 3771 N93-32215
CALIFORNIA UNIV., SAN DIEGO, LA JOLLA.
A model for coronal streamer observations using the SOHO coronagraph instrumentation p 3870 N93-31361
Active control of flow induced resonance in continuous corrugated tubes [AD-A265782] p 3727 N93-32310
CALIFORNIA UNIV., SANTA BARBARA.
The conditions leading to intense low frequency generation and strong localization in two level systems [AD-A265110] p 3819 N93-31791
The optical response of a double quantum well driven by two lasers: Localization and low frequency generation [AD-A265118] p 3819 N93-31792
Efficient optical logic, interconnections and processing using quantum confined structures [AD-A265734] p 3823 N93-31799
CALSPAN-BUFFALO UNIV. RESEARCH CENTER, NY.
Heat transfer and pressure measurements for the SSME fuel turbine p 3698 N93-31587
CAMBRIDGE UNIV. (ENGLAND).
Abundance determination in the quiet corona p 3877 N93-31407
Study of ISM turbulence using radiointerferometers (new method) p 3847 N93-31767
Submillimetre line observations of molecular clouds p 3848 N93-31772
CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
Formal specification and verification of concurrent programs [AD-A265201] p 3790 N93-31793
Ultra-high density recording technologies p 3840 N93-31971
An overview of PCTE: A basis for a Portable Commo n Tool Environment [AD-A265202] p 3791 N93-32000
The priority inversion problem and real-time symbolic model checking [AD-A265408] p 3791 N93-32044
Venari/ML interfaces and examples [AD-A265416] p 3841 N93-32048
Research in transparent informed prefetching [AD-A265417] p 3842 N93-32049
Connectionist models and linguistic theory: Investigations of stress systems in language [AD-A265450] p 3777 N93-32064
A new definition of the subtype relation [AD-A265548] p 3791 N93-32066
An iconic programming language for sensor-based robots p 3793 N93-32098
The MICRO-BOSS scheduling system: Current status and future efforts p 3835 N93-32133
CATANIA ASTROPHYSICAL OBSERVATORY (ITALY).
Ly-alpha radiation from coronal transients p 3870 N93-31363
CATHOLIC UNIV. OF AMERICA, WASHINGTON, DC.
Mechanisms of microwave induced damage in biologic materials [AD-A264415] p 3772 N93-32035
CENTER FOR MATHEMATICS AND COMPUTER SCIENCE, AMSTERDAM (NETHERLANDS).
Tests on semi-Lagrangian transport and interpolation [CWI-NM-R921M] p 3756 N93-32393
Parallel Jacobi iteration in implicit step-by-step methods [CWI-NM-R9218] p 3810 N93-32394
Explicit, high-order Runge-Kutta-Nystroem methods for parallel computers [CWI-NM-R9219] p 3796 N93-32395
Parallel block predictor-corrector methods of Runge-Kutta type [CWI-NM-R9220] p 3797 N93-32396
CENTERS FOR DISEASE CONTROL, ATLANTA, GA.
Fundamental diagnostic hematology: Anemia (second edition) [PB93-188662] p 3773 N93-31140
Fundamental diagnostic hematology: The bleeding and clotting disorders (second edition) [PB93-188670] p 3773 N93-31158
CENTRAL STATE UNIV., WILBERFORCE, OH.
Ground Robotic Hand Applications for the Space Program study (GRASP) [NASA-CR-193571] p 3737 N93-32235
CENTRE D'ESSAIS AERONAUTIQUE TOULOUSE (FRANCE).
Crack growth prediction models p 3682 N93-31747
Crack growth prediction results p 3682 N93-31748
CENTRE D'ETUDES ET DE RECHERCHES DE MEDECINE AEROSPATIALE, BRETIGNY SUR ORGE (FRANCE).
Protein requirements in hypoxia or hypokinesia p 3778 N93-32244
CENTRE DE RECHERCHES EN PHYSIQUE DE L'ENVIRONNEMENT, ISSY-LES-MOULINEAUX (FRANCE).
Can ULF fluctuations observed at the magnetopause play a role in anomalous diffusion? p 3855 N93-31693
Mirror mode and other compressive ULF modes p 3719 N93-31711
CENTRE NATIONAL D'ETUDES SPATIALES, TOULOUSE (FRANCE).
Protection and regulation on direct-direct chopping converters [CNES-NT-129] p 3719 N93-31475
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, PARIS (FRANCE).
Human factors and the safety of flights: The importance of the management of sleep p 3782 N93-32267
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, VERRIERES-LE BUISSON (FRANCE).
SWAN: A study of solar wind anisotropies p 3868 N93-31351
The SUN/SIMURIS interferometer p 3845 N93-31759
The lunar interferometer for solar physics p 3847 N93-31768
Study of an optimized configuration for interferometric imaging of complex and extended solar structures p 3849 N93-31780
CENTRO BRASILEIRO DE PESQUISAS FISICAS, RIO DE JANEIRO.
On the Dirac equation in three dimensions [DE93-609915] p 3813 N93-31181
CENTRO DE INSTRUCCION DE MEDICINA AEROESPATIAL, MADRID (SPAIN).
Cardiovascular Risk Factors (CVRF) in Spanish pilots with coronary artery disease demonstrated by angiographic studies p 3775 N93-32253
Survey of smoking habits in the Spanish Air Force p 3781 N93-32262
CERAMATEC, INC., SALT LAKE CITY, UT.
Advanced alternate planar geometry solid oxide fuel cells [DE93-000248] p 3721 N93-32174
CESKOSLOVENSKA AKADEMIE VED, ONDREJOV.
Mass motion of a heated plasma blob in a coronal loop p 3874 N93-31384
Pulse-beam heating in flare loops p 3875 N93-31392
CESKOSLOVENSKA AKADEMIE VED, PRAGUE.
Role of the INTERBALL small scale investigations in the GGS program p 3859 N93-31717
CHICAGO UNIV., IL.
Study of pipe friction reduction materials for gas transportation. [PB93-189181] p 3724 N93-31438
Irregular oscillations of the West Antarctic Ice Sheet p 3759 N93-31884
CINCINNATI UNIV., OH.
An integrated eddy current detection and imaging system on a silicon chip p 3693 N93-31560
Four dimensional reconstruction and analysis of plume images p 3694 N93-31561
CIVIL AVIATION AUTHORITY, LONDON (ENGLAND).
Mandatory multi-engined training syllabus [CAP-601] p 3776 N93-31729
Reportable accidents to UK registered aircraft, and to foreign registered aircraft in UK airspace, 1990 [CAP-600] p 3674 N93-31730
Reaction to aircraft noise near general aviation airfields [DORA-8203] p 3817 N93-32377
UK airmisses involving commercial air transport, September - December 1991 [ETN-93-93930] p 3674 N93-32409
CLARK-ATLANTA UNIV., GA.
Theoretical investigation of electron-positive ion/atom interactions [DE93-012933] p 3822 N93-32162
CLARKSON UNIV., POTSDAM, NY.
Iterative equation solving techniques in boundary element analysis p 3802 N93-31141
COLLEGE DE FRANCE, PARIS.
Interferometry from the Moon p 3845 N93-31757
A concept of deployable tethered interferometer p 3691 N93-31787
Interferometer concepts for astrometry in space p 3691 N93-31788
COLORADO STATE UNIV., FORT COLLINS.
Scattering by irregular particles in anomalous diffraction and discrete dipole approximations p 3817 N93-31154
Multivariate problems of statistics, combinatorics, reliability, and signal processing [AD-A265213] p 3811 N93-32003
Parametric and combinatorial problems in constrained optimization [AD-A265595] p 3792 N93-32096
Numerical modelling of mesoscale atmospheric dispersion, volumes 1 and 2 p 3765 N93-32217
COLORADO UNIV., BOULDER.
U.S. National weather experiment STORM-FEST 1992: Wave and turbulence in frontal zones [AD-A264294] p 3766 N93-31182
Modelling the large scale structure of the solar corona p 3870 N93-31362
Observational constraints on coronal hole density model p 3871 N93-31364
Lithology and chronology of ice-sheet fluctuations (magnetic susceptibility of cores from the western Ross Sea) p 3759 N93-31880
An investigation of the channel crosstalk in optical heterodyne controlled phased array radars [AD-A265412] p 3717 N93-32046
COLUMBIA UNIV., NEW YORK, NY.
Study of improved critical currents and mechanical properties in YBaCuO superconductor with Ag or 211 [AD-A265749] p 3829 N93-31804
COMMISSION OF THE EUROPEAN COMMUNITIES, BRUSSELS (BELGIUM).
The effect of changes in markets and trade barriers on the exchange of scientific and technical information p 3836 N93-31216
COMPUTER AND BUSINESS EQUIPMENT MFRS. ASSOCIATION, WASHINGTON, DC.
The standards process: X3 information processing systems p 3840 N93-31966
COMPUTER SCIENCES CORP., HAMPTON, VA.
Advanced Transport Operating System (ATOPS) utility library software description [NASA-CR-191469] p 3680 N93-32218
COMPUTER SCIENCES CORP., RESEARCH TRIANGLE PARK, NC.
Regional modeling analysis of the dependencies of atmospheric oxidants to perturbations in NOx and hydrocarbon emissions [PB93-180925] p 3754 N93-32070
CONNECTICUT UNIV., STORRS.
Relationships between ozone precursor levels and response to emissions reductions: Analysis of regional oxidant model results for the northeastern United States [PB93-186294] p 3756 N93-32189
CONSIGLIO NAZIONALE DELLE RICERCHE, FRASCATI (ITALY).
Role of the INTERBALL small scale investigations in the GGS program p 3859 N93-31717

CORNELL UNIV., ITHACA, NY.
Real-time trajectory optimization on parallel processors
[NASA-CR-193303] p 3795 N93-31640
Geochemical, genetic, and physiological control of pollutant biodegradation
[AD-A264106] p 3753 N93-32027
CULVER (W. J.) CONSULTING, INC., VIENNA, VA.
Grand challenges in mass storage: A system integrator's perspective p 3840 N93-31973

D

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA).
Neurophysiological analysis of circadian rhythm entrainment
[AD-A264681] p 3774 N93-32018
DAYTON UNIV., OH.
Enhanced methods for determining operational capabilities and support costs of proposed space systems
[NASA-CR-193265] p 3812 N93-32350
DCW INDUSTRIES, LA CANADA, CA.
Turbulence and transition modeling for high-speed flows
[NASA-CR-191473] p 3727 N93-32329
DEFENCE RESEARCH AGENCY, FARNBOROUGH (ENGLAND).
Fractographic investigation of IMI 685 crack propagation specimens for SMP SC33 p 3681 N93-31743
DEFENCE RESEARCH ESTABLISHMENT SUFFIELD, RALSTON (ALBERTA).
The effect of sensory input on trajectories generated by recurrent neural networks
[AD-A264501] p 3799 N93-32036
DELAWARE UNIV., NEWARK.
Fundamental studies of new high-energy permanent magnet materials
[DE93-014707] p 3815 N93-32291
DEPARTMENT OF DEFENSE, WASHINGTON, DC.
Standardization Directory: FSC class and area assignments
[AD-A265686] p 3839 N93-31796
DEPARTMENT OF ENERGY, IDAHO FALLS, ID.
The applicability and availability of Former Soviet Union (FSU) space-related capabilities and facilities to energy-related space activities of Department of Energy, Department of Defense and National Aeronautics and Space Administration
[DE93-010286] p 3686 N93-32178
DEPARTMENT OF ENERGY, WASHINGTON, DC.
EXAM: A two-state thermodynamic analysis program
[PB93-191658] p 3703 N93-31817
DEPARTMENT OF NATIONAL DEFENCE, OTTAWA (ONTARIO).
Material characterization and fractographic examination of Ti-17 fatigue crack growth specimens for SMP SC33 p 3681 N93-31744
DEPARTMENT OF THE AIR FORCE, WASHINGTON, DC.
Land subsidence and problems affecting land use at Edwards Air Force Base and vicinity, California, 1990
[PB93-182236] p 3765 N93-32191
DEPARTMENT OF THE NAVY, WASHINGTON, DC.
Noise attenuating circuit for mechanical relay including optical isolation
[AD-D015700] p 3720 N93-31842
Method and apparatus for characterizing the quality for electrically thin semiconductor films
[AD-D015734] p 3830 N93-32206
Optically powered photomultiplier tube
[AD-D015735] p 3722 N93-32207
Sealed acoustical element using conductive epoxy
[AD-D015736] p 3730 N93-32208
Epoxy self-priming topcoats
[AD-D015737] p 3711 N93-32209
Fix-tracking system
[AD-D015738] p 3718 N93-32210
Liquid-crystal heat valve controlled with multiple electrode pairs
[AD-D015739] p 3830 N93-32211
DEUTSCHE FORSCHUNGSANSTALT FUER LUFT- UND RAUMFAHRT, BRUNSWICK (GERMANY).
Definition of an airfoil family for the EUROFAR rotor
[DLR-FB-92-04] p 3679 N93-31197
The DLR test aircraft in the FZ-BS, -VFW 614/ATTAS, Dornier DO 228-101, MBB BO105 S-3 p 3675 N93-31272
The basic measurement equipment of the DLR test aircraft p 3675 N93-31273
Ground installations for preparation and evaluation of flight tests p 3675 N93-31274
Instigation and processing of flight tests in DLR p 3675 N93-31275
ATTAS experimental-cockpit and ATMOS for component and system investigations in flight guidance p 3676 N93-31276
Testing of an experimental FMS p 3676 N93-31277
Testing concept of a taxiing control system, summary p 3676 N93-31278
Pallet for helicopter test instrumentation p 3676 N93-31279
Development and flight testing of a fault-tolerant fly-by-light yaw control system p 3676 N93-31280
Ground- and satellite-derived flight-path measurements as demonstrated in the AFES Avionics Flight Evaluation System (AFES) p 3677 N93-31281
On-board derived flight-path measurement as demonstrated by an ILS measurement system p 3677 N93-31282
Installations and methods for measurement of aircraft radio components and systems p 3677 N93-31284
The influence of variable flow velocity on unsteady airfoil behavior
[DLR-FB-92-22] p 3672 N93-31320
Pulse-modulated control of switching valves for an electro-hydraulic servo actuator
[DLR-FB-92-18] p 3719 N93-31462
DEUTSCHE FORSCHUNGSANSTALT FUER LUFT- UND RAUMFAHRT, GOETTINGEN (GERMANY).
The ViB-code to simulate 3-D stator/rotor flow in axial turbines
[DLR-FB-92-19] p 3681 N93-31170
TDLM: A Transonic Doublet Lattice Method for 3D potential unsteady transonic flow calculation
[DLR-FB-92-25] p 3671 N93-31171
DEUTSCHE FORSCHUNGSANSTALT FUER LUFT- UND RAUMFAHRT, HAMBURG (GERMANY).
Computer-generated parallel tests for aptitude measurement in the selection of aviation operators
[DLR-FB-92-29] p 3775 N93-31229
Background and objectives of the PARAT program p 3775 N93-31230
Phases of the project development and examination methodologies p 3775 N93-31231
The position test: A computer generated process for acquisition of inductive logic thinking p 3775 N93-31232
The test memorization of symbols and numbers: A computer generated test for visual sensitivity p 3775 N93-31233
The clearance test: A computer generated process for acquisition of auditive short term sensitivity p 3776 N93-31234
The concentration loading test system: A computer generated process for acquisition of attentiveness control p 3776 N93-31235
The aircraft position tests: A computer generated process for acquisition of spatial orientation capability p 3776 N93-31236
The cube rotation test: A computer generated process for acquisition of mental spatial manipulator capability p 3776 N93-31237
The PARAT tests as examination system p 3776 N93-31238
DEUTSCHE FORSCHUNGSANSTALT FUER LUFT- UND RAUMFAHRT, OBERPFAFFENHOFEN (GERMANY).
Climatic effects of harmful emissions from high altitude air traffic p 3752 N93-31926
DEUTSCHE FORSCHUNGSANSTALT FUER LUFT- UND RAUMFAHRT, STUTTGART (GERMANY).
Potential distributions at gas evolving electrodes
[DLR-FB-92-20] p 3702 N93-31319
High cycle fatigue of glass fibre reinforced epoxy materials for wind turbines
[DLR-FB-92-17] p 3700 N93-31461
DEUTSCHE GEODAETISCHE KOMMISSION, MUNICH (GERMANY).
Differential small displacements and rotation extensions in three dimensional coordinate systems
[SER-B-295] p 3804 N93-31338
Radiointerferometric observations for estimation of pole motion by using long north-south reference axes
[SER-C-368] p 3746 N93-31339
Conception of a modular real-time system for laser remote sensing with particular consideration of upward compatibility
[SER-C-378] p 3731 N93-31340
DEUTSCHE SYSTEM-TECHNIK G.M.B.H., BREMEN (GERMANY).
Testing of an experimental system for image reconnaissance p 3677 N93-31283
DORTMUND UNIV. (GERMANY).
Effects on health of noise disturbances due to air traffic p 3753 N93-31929
DRAPER (CHARLES STARK) LAB., INC., CAMBRIDGE, MA.
Fuzzy based attitude controller for flexible spacecraft with on/off thrusters
[NASA-CR-188250] p 3690 N93-32228
DREXEL UNIV., PHILADELPHIA, PA.
Effects of atomic coherence on multi-level lasing systems p 3731 N93-31133
DRL, BERLIN (GERMANY).
Role of the INTERBALL small scale investigations in the GGS program p 3859 N93-31717

E

EASTMAN KODAK CO., ROCHESTER, NY.
Kodak phase-change media for optical tape applications p 3730 N93-31974
EDGERTON, GERMESHAUSEN AND GRIER, INC., IDAHO FALLS, ID.
Study of wall heat transfer from a high temperature dissociated hydrogen impinging jet
[DE92-017845] p 3698 N93-32184
EG AND G ENERGY MEASUREMENTS, INC., IDAHO FALLS.
Video conferencing made easy
[DE93-010798] p 3718 N93-32283
EIDGENOESSISCHE TECHNISCHE HOCHSCHULE, ZURICH (SWITZERLAND).
Design and application of Active Magnetic Bearings (AMB) for vibration control p 3738 N93-32279
ELECTRIC POWER RESEARCH INST., PALO ALTO, CA.
Proceedings: 1991 SO2 Control Symposium, volume 2, sessions 4 and 5A
[PB93-196103] p 3754 N93-32090
Proceedings: 1991 SO2 Control Symposium, volume 3, sessions 5B and 6
[PB93-196111] p 3755 N93-32091
Proceedings: 1991 SO2 Control Symposium, volume 4, session 7
[PB93-196129] p 3755 N93-32092
Proceedings: 1991 SO2 Control Symposium, volume 5, session 8
[PB93-196137] p 3755 N93-32093
EMORY UNIV., ATLANTA, GA.
Laser-assisted chemical vapor deposition of InN on Si(100)
[AD-A264266] p 3731 N93-31095
ENVIRONMENTAL PROTECTION AGENCY, ANN ARBOR, MI.
Spray characteristics of two types of fuel injectors
[PB93-180859] p 3736 N93-32069
ENVIRONMENTAL PROTECTION AGENCY, RESEARCH TRIANGLE PARK, NC.
Two new gas standards programs at the National Institute of Standards and Technology
[PB93-191427] p 3751 N93-31816
Methodology to apportion ambient air measurements to investigate potential effects on air quality near waste incinerators
[PB93-191393] p 3754 N93-32088
Proceedings of the 1991 SO2 Control Symposium, volume 1
[PB93-196095] p 3755 N93-32168
Source apportionment of air pollution in China: Extending the usefulness of receptor modeling by combining multivariate and chemical mass balance models
[PB93-185726] p 3756 N93-32188
ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC.
Online guided tour of the Cleanup Information Bulletin Board System. (CLU-IN: Cleanup Information Bulletin Board)
[PB93-193704] p 3752 N93-31818
TSCA confidential business information security manual
[PB93-184844] p 3839 N93-31833
RCRA implementation plan, FY 1993
[PB93-176956] p 3752 N93-31877
EUROPEAN SOUTHERN OBSERVATORY, GARCHING (GERMANY).
The VLT interferometer: Current status and expectations for the next 20 years p 3846 N93-31763
Advanced lunar-based interferometer for solar observations p 3847 N93-31769
Summary of the splinter session on optical and UV science p 3848 N93-31773
EUROPEAN SPACE AGENCY, PARIS (FRANCE).
Flight test of avionic and air-traffic control systems
[ESA-TT-1279] p 3675 N93-31271
Radiation from a dipole antenna into an inhomogeneous compressible and nonlinear space-plasma
[ESA-TT-1261] p 3716 N93-31341
Phased array for mobile satellite communications
[ESA-TT-1280] p 3716 N93-31342
Proceedings of the First SOHO Workshop: Coronal Streamers, Coronal Loops, and Coronal and Solar Wind Composition
[ESA-SP-348] p 3867 N93-31343

Perforated carbon-epoxy plates damage modeling for quasi-static biaxial loading
[ESA-TT-1273] p 3740 N93-31428
Contribution to the theoretical study and finite-element approximation of the multidimensional, multispecies, hyperbolic system of gas dynamics
[ESA-TT-1275] p 3724 N93-31429
Evaluation of future space transportation systems with regard to their reliability and costs
[ESA-TT-1281] p 3687 N93-31593
Study of the Solar-Terrestrial System
[ESA-SP-346] p 3852 N93-31674
Targets for Space-Based Interferometry
[ESA-SP-354] p 3844 N93-31750
Efficient numerical techniques for the analysis of complex microstrip-antennas and microstrip-arrays
[ESA-TT-1259] p 3717 N93-31861

EUROPEAN SPACE AGENCY. EUROPEAN SPACE RESEARCH AND TECHNOLOGY CENTER, ESTEC, NOORDWIJK (NETHERLANDS).
Some European activities in support of the SOHO mission p 3880 N93-31425
Composites design handbook: Update
[ESA-PSS-03-1101-ISSUE-1-RE] p 3701 N93-31740

EXOS, INC., BURLINGTON, MA.
Prevention of cumulative trauma disorders
[PB93-188332] p 3773 N93-31138

F

FACHHOCHSCHULE, MUNICH (GERMANY).
Effects of air traffic on nature and environment in the neighborhood of airports by example of the Munich 2 Airport (Germany) p 3753 N93-31932

FEDERAL AVIATION ADMINISTRATION, ATLANTIC CITY, NJ.
Investigation of advanced technology for airway facilities maintenance training
[DOT/FAA/CT-TN92/24] p 3678 N93-32336

FERMI NATIONAL ACCELERATOR LAB., BATAVIA, IL.
Constraints on cosmic strings due to black holes formed from collapsed cosmic string loops
[NASA-CR-193248] p 3861 N93-31837
Sterile neutrinos as dark matter
[DE93-012533] p 3822 N93-32294

FINNISH METEOROLOGICAL INST., HELSINKI.
Interplanetary hydrogen gas as a monitor of the Sun's corpuscular and radiative output p 3878 N93-31412

FLINDERS UNIV., ADELAIDE (AUSTRALIA).
Least squares orthogonal polynomial approximation in several independent variables
[DE93-609832] p 3802 N93-31180

FLORENCE UNIV. (ITALY).
The prominence-corona interface: Models and observations p 3873 N93-31378

FLORIDA SEA GRANT COLL., GAINESVILLE.
Florida's estuaries: A citizen's guide to coastal living and conservation
[PB93-189330] p 3751 N93-31113

FLORIDA STATE UNIV., TALLAHASSEE.
Thermodynamic structure of subsidence inversions in the Atlantic subtropical anticyclone regime
[AD-A265406] p 3768 N93-32043

FLORIDA UNIV., GAINESVILLE.
Metastability in molecules
[AD-A264344] p 3817 N93-31063
Development of practical MO techniques for prediction of the properties and behavior of materials
[AD-A265730] p 3820 N93-31798

FOM-INST. VOOR PLASMAFYSICA, RIJNHUIZEN, JUTPHAAS (NETHERLANDS).
Coronal heating: The role of resonant absorption p 3876 N93-31396

FOREST SERVICE, OGDEN, UT.
Monitoring vegetation greenness with satellite data
[PB93-190882] p 3744 N93-31213

G

GAS RESEARCH INST., CHICAGO, IL.
Environment and safety research
[PB93-188860] p 3751 N93-31142
GRI proceedings on the Workshop on Plastic Pipe Research Results
[PB93-190460] p 3708 N93-31211
Study of pipe friction reduction materials for gas transportation.
[PB93-189181] p 3724 N93-31438

GENERAL ELECTRIC CO., CINCINNATI, OH.
Internal structural characterization
[AD-A264762] p 3738 N93-31982

GENERAL ELECTRIC CO., MOORESTOWN, NJ.
Integration of domain and resource-based reasoning for real-time control in dynamic environments p 3794 N93-32141

GEOLOGICAL SURVEY, DENVER, CO.
Effect of subglacial volcanism on changes in the West Antarctic Ice Sheet p 3762 N93-31901
Chemical modeling constraints on Martian surface mineralogies formed in an early, warm, wet climate, and speculations on the occurrence of phosphate minerals in the Martian regolith p 3865 N93-31956

GEOLOGICAL SURVEY, FLAGSTAFF, AZ.
Velocities of Thwaites and Land glaciers p 3760 N93-31885

GEOLOGICAL SURVEY, RESTON, VA.
Effects of low-level radioactive-waste disposal on water chemistry in the unsaturated zone at a site near Sheffield, Illinois, 1982-1984
[PB93-183051] p 3752 N93-31829
Recent acceleration of Thwaites Glacier p 3761 N93-31893

GEOLOGICAL SURVEY, SACRAMENTO, CA.
Land subsidence and problems affecting land use at Edwards Air Force Base and vicinity, California, 1990
[PB93-182236] p 3765 N93-32191

GEORGE MASON UNIV., FAIRFAX, VA.
DLTS and dynamic transconductance analysis of deep-submicron fully-depleted SOI MOSFETs
[AD-A264888] p 3721 N93-31984
Automatic Target Recognition (ATR) using Distributed Associative Memories (DAMS)
[AD-A265613] p 3800 N93-32169
Experiments on a general thermoacoustic engine
[AD-A265864] p 3817 N93-32317

GEORGE WASHINGTON UNIV., WASHINGTON, DC.
Knowledge-based framework for an automated user interface presentation design tool p 3836 N93-31135

GEORGIA INST. OF TECH., ATLANTA.
The 1st International Conference on Millimeter Wave and Far-Infrared Technology
[AD-A264268] p 3715 N93-31096
Robust stability of second-order systems
[NASA-CR-193624] p 3809 N93-32373

GERMAN AIR FORCE, FUERSTENFELDBRUK (GERMANY).
Results and management of pathological lipoprotein concentrations and other cardiovascular risk factors in military pilots of the German Federal Armed Forces p 3775 N93-32254

GESELLSCHAFT FUER STRAHLENFORSCHUNG M.B.H., MUNICH (GERMANY).
Air Traffic and Environment
[GSF-BAND-8] p 3752 N93-31925
Radiation exposure in aircraft p 3753 N93-31928

GLASGOW UNIV. (SCOTLAND).
Bayesian analysis of SOHO spectra p 3876 N93-31398

GOOD SAMARITAN HOSPITAL AND MEDICAL CENTER, PORTLAND, OR.
Torsional vestibulo-ocular reflex measurements for identifying otolith asymmetries possibly related to space motion sickness susceptibility
[NASA-CR-193304] p 3774 N93-32364

GOSUDARSTVENNYI KOMITET PO ISPOLZOVANIYU ATOMNOI ENERGII, MOSCOW (USSR).
Nuclear structure effects in elastic and inelastic scattering of light ions
[DE93-616909] p 3822 N93-32407

GRENOBLE-1 UNIV. (FRANCE).
Imaging circumstellar disks around young stars by multi-aperture interferometry p 3847 N93-31766

GRONINGEN RIJKSUNIV. (NETHERLANDS).
Relativistic transport theory
[KVI-952] p 3830 N93-31121
Covariant description of the delta in nuclear matter
[KVI-951] p 3817 N93-31149
Necessary and sufficient conditions for J-spectral factorizations with a J-lossless property for infinite-dimensional systems in continuous and discrete time
[W-9217] p 3798 N93-31512
Analytic system problems and J-lossless factorization for infinite-dimensional linear systems
[W-9218] p 3798 N93-31513
Robust stabilization of infinite-dimensional systems with respect to coprime factor perturbations
[W-9220] p 3805 N93-31514
On global bifurcations caused by the unfolding of a homoclinic orbit
[W-9221] p 3806 N93-31524
Sampled-data and discrete-time H2 optimal control
[W-9222] p 3798 N93-31525
A normally elliptic Hamiltonian bifurcation
[W-9214] p 3807 N93-31623
Homoclinic twist bifurcations with Z2 symmetry
[W-9215] p 3807 N93-31627

HUNGARIAN ACADEMY OF SCIENCES
H infinity-control with measurement-feedback for Pritchard-Salamon system
[W-9211] p 3799 N93-31628
Computerized tomography and its applications: A guided tour
[CS-9206] p 3789 N93-31629

GROUPEMENT DES INDUSTRIES FRANCAISES AERONAUTIQUES ET SPATIALES, PARIS (FRANCE).
French aerospace equipment p 3883 N93-31734

H

HAMPTON UNIV., VA.
Evaluation of candidate working fluid formulations for the electrothermal-chemical wind tunnel
[NASA-CR-193366] p 3684 N93-31848
The 1992 Langley Aerospace Research Summer Scholars (LARSS) program
[NASA-CR-193371] p 3833 N93-32229

HARRIS, MILLER, MILLER AND HANSON, INC., LEXINGTON, MA.
Noise from high speed maglev systems: Noise sources, noise criteria, preliminary design guidelines for noise control, and recommendations for acoustical test facility for maglev research
[PB93-154896] p 3736 N93-32193

HARVARD-SMITHSONIAN CENTER FOR ASTROPHYSICS, CAMBRIDGE, MA.
UVCS: The ultraviolet coronograph spectrometer for SOHO p 3868 N93-31349
Simulated O VI Doppler dimming measurements of coronal outflow velocities p 3871 N93-31367
Temperature measurements in the inner corona p 3877 N93-31402
Measuring electron temperature in the extended corona p 3880 N93-31422
Ultraviolet imaging interferometry p 3844 N93-31752

HAWAII UNIV., HONOLULU.
Observations of the quiet Sun from the soft x ray telescope on Yohkoh p 3874 N93-31388
The application of remotely sensed data to studies of volcanism within the Galapagos Islands p 3747 N93-32326

HAWAII UNIV., MANOA.
Visible and infrared investigations of planet-crossing asteroids and outer solar system objects
[NASA-CR-193511] p 3844 N93-31604

HEBREW UNIV., JERUSALEM (ISRAEL).
Mathematical inversion of multiple-scattering of laser light
[DE93-609128] p 3803 N93-31224

HELLENIC AIR FORCE AEROMEDICAL CENTER, ATHENS (GREECE).
Lipidemic profile of Hellenic Airforce officers p 3774 N93-32250

HELLENIC AIR FORCE GENERAL HOSPITAL, ATHENS (GREECE).
Correlation of life-style and dietary concomitants of Greek pilots with serum analytes p 3780 N93-32256

HEURISTICRATS, BERKELEY, CA.
Decision-theoretic control of EUVE telescope scheduling p 3835 N93-32134

HONEYWELL, INC., BLOOMINGTON, MN.
R and D status report: RF vacuum microelectronics
[AD-A264381] p 3721 N93-32033

HONEYWELL, INC., MINNEAPOLIS, MN.
Scheduling with partial orders and a causal model p 3835 N93-32130

HOUSTON UNIV., TX.
Analysis of effective thermal conductivity of fibrous materials
[NASA-CR-193242] p 3709 N93-31636

HUDSON RIVERS CONSULTANCY, WOODFORD GREEN (ENGLAND).
The management of change: Implications for the information professional p 3838 N93-31222

HUGHES STX, INC., LANHAM, MD.
Surface velocity fields of Ice Streams D and E derived from repeat satellite imagery p 3760 N93-31890

HULBURT (E. O.) CENTER FOR SPACE RESEARCH, WASHINGTON, DC.
The Large Angle Spectroscopic Coronagraph (LASCO): Visible light coronal imaging and spectroscopy p 3868 N93-31350
The physics of solar prominences p 3874 N93-31383

HUNGARIAN ACADEMY OF SCIENCES, BUDAPEST.
Symposium on Applied Mathematical Programming and Modeling (APMOD93): Volume of extended abstracts
[AD-A264091] p 3784 N93-31087
The structure of the dayside boundary layer between the Venus ionosphere and the shocked solar wind p 3853 N93-31678

HYGIENE-INST. DES RUHRGEBIETS, GELSENKIRCHEN (GERMANY).
Effects of commercial flight pollution on human health p 3753 N93-31931

I

IBM FEDERAL SYSTEMS DIV., HOUSTON, TX.
Current state of the mass storage system reference model p 3840 N93-31965
ILLINOIS INST. OF TECH., CHICAGO.
Creating a structured knowledge base by parsing natural language text p 3839 N93-31854
ILLINOIS UNIV., CHAMPAIGN.
Performance of a distributed superscalar storage server p 3841 N93-31978
ILLINOIS UNIV., URBANA.
PERTS: A Prototyping Environment for Real-Time Systems p 3794 N93-32147
Producing approximate answers to database queries p 3843 N93-32150
Implementation of interconnect simulation tools in spice
[NASA-CR-193619] p 3792 N93-32239
ILLINOIS UNIV., URBANA-CHAMPAIGN.
Experimental analysis of computer system dependability
[NASA-CR-193401] p 3785 N93-32233
Application of compiler-assisted multiple instruction rollback recovery to speculative execution
[NASA-CR-193360] p 3796 N93-32355
IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON (ENGLAND).
Report on the ESA Interferometry Study Team activities p 3846 N93-31762
Interferometry at the vacuum ultra-violet limit p 3850 N93-31785
Basic structural dynamics p 3741 N93-32271
Structural dynamic characteristics of individual blades p 3683 N93-32272
Structural dynamic charactertistics of bladed assemblies p 3683 N93-32273
INDIANA UNIV., BLOOMINGTON.
Quantum spectra and dynamics p 3831 N93-31129
Structure, evolution, and stability of rotating protostars p 3852 N93-31153
INDUSTRIEANLAGEN-BETRIEBSGESELLSCHAFT M.B.H., OTTOBRUNN (GERMANY).
Conclusions and recommendations p 3682 N93-31749
INFORMATION INTERNATIONAL ASSOCIATES, INC., OAK RIDGE, TN.
Forecasting and planning for changing patterns of Scientific and Technical Communication (STC) p 3838 N93-31223
INSTITUT D'ASTROPHYSIQUE, PARIS (FRANCE).
Streamer eclipse observations p 3869 N93-31357
INSTITUT FUER ANGEWANDTE GEODAESIE, FRANKFURT AM MAIN (GERMANY).
Reports on Cartography and Topography, series 1, report no. 103
[ETN-90-97325] p 3744 N93-31256
European Road Database: Activities within the ATKIS p 3744 N93-31257
Aerial cartography using SICAD NAV-AIR p 3744 N93-31258
Digital reading of road network data in developing a cartographic information system p 3744 N93-31259
GDF: A digitizing format for geographical data p 3744 N93-31260
A query language for spatial data p 3745 N93-31261
An electronic sea map p 3745 N93-31262
Automatic acquisition of elevation points in map-making using the TUEK 200 p 3745 N93-31263
A catalog of landscape features. A modeling instrument for the ATKIS information system p 3745 N93-31264
Accuracy estimation for digitizing p 3745 N93-31265
Geographical and topographical data from satellite images used in developing a digital road topology database p 3745 N93-31266
Access and content of the EDBS topographic-cartographic information system (ATKIS) p 3745 N93-31267
SCRIBO: An interactive grid-base name placement system for map making p 3745 N93-31268
The use of digital road data by a navigation system p 3678 N93-31269
A searching method in a declarative city map p 3746 N93-31270
INSTITUT NATIONAL POLYTECHNIQUE, GRENOBLE (FRANCE).
On the integration of algebraic and logic languages
[ETN-93-94238] p 3786 N93-31205
Integration and implementation of the automated natural deduction in demonstrators using resolution
[ETN-93-94239] p 3803 N93-31208
INSTITUTE FOR ADVANCED STUDY, PRINCETON, NJ.
Localization and transport in random media
[AD-A264640] p 3726 N93-32014
INSTITUTE FOR AEROSPACE RESEARCH, OTTAWA (ONTARIO).
Fatigue crack growth results for Ti-6Al-4V, IMI 685, and Ti-17 p 3682 N93-31746
INSTITUTE FOR COMPUTER APPLICATIONS IN SCIENCE AND ENGINEERING, HAMPTON, VA.
Reduction method with system analysis for multiobjective optimization-based design
[NASA-CR-191456] p 3803 N93-31194
On waveform multigrid method
[NASA-CR-191455] p 3808 N93-31843
Optimal fixed-finite-dimensional compensator for Burgers' equation with unbounded input/output operators
[NASA-CR-191454] p 3808 N93-31857
An efficient model for coupling structural vibrations with acoustic radiation
[NASA-CR-191452] p 3816 N93-31868
High performance FORTRAN without templates: An alternative model for distribution and alignment
[NASA-CR-191451] p 3792 N93-32323
Mapping robust parallel multigrid algorithms to scalable memory architectures
[NASA-CR-191470] p 3793 N93-32359
INSTITUTE FOR DEFENSE ANALYSES, ALEXANDRIA, VA.
Strategic management: Managing change by managing participation
[AD-A265796] p 3834 N93-32311
INSTITUTE OF AVIATION MEDICINE, OSLO (NORWAY).
Changes in food and energy intake in military aircrew p 3778 N93-32246
INSTITUTE OF SOUND AND VIBRATION RESEARCH, SOUTHAMPTON (ENGLAND).
Practical flow duct acoustic modelling
[ISVR-TR-213] p 3726 N93-31838
Transmission of vibration through the human body to the head: A summary of experimental data
[ISVR-TR-218] p 3774 N93-32237
The prediction of noise from co-axial jets
[ISVR-TR-215] p 3817 N93-32339
Vibrational power transmission in curved beams. Part 1: Theory
[ISVR-TR-208] p 3742 N93-32340
INSTITUTO DE ENGENHARIA NUCLEAR, RIO DE JANEIRO (BRAZIL).
Molecular dynamical and structural studies for the bakelite by neutron cross section measurements
[DE93-609444] p 3819 N93-31244
QUASAR: An interactive program for spectrum analysis in personal computers
[DE93-609814] p 3786 N93-31248
INSTITUTO DE FISICA TEORICA, SAO PAULO (BRAZIL).
BCS universal constants for high-temperature superconductivity
[DE92-642079] p 3830 N93-32405
INSTITUTO DE PESQUISAS ENERGETICAS E NUCLEARES, SAO PAULO (BRAZIL).
Chemical effects of ionizing radiations and electron beam in polymers: Industrial uses
[DE93-609337] p 3708 N93-31179
Physical characterization and study of the electrical magnetic and thermal properties of the ceramic high Tc superconductor Y1Ba2Cu3O(7-x)
[DE92-640219] p 3711 N93-32187
Utilization of high energy electron beam in the treatment of drinking and waste water
[DE92-642335] p 3783 N93-32406
INSTITUTO DE PESQUISAS ESPACIAIS, SAO JOSE DOS CAMPOS (BRAZIL).
Tetragonal zirconia ceramics in Zr O2-Ce O2 system (CP): Preparation, characterization, and mechanical properties
[DE93-606833] p 3708 N93-31089
INTEGRATED SYSTEMS, INC., SANTA CLARA, CA.
Set-membership identification for robust control design
[AD-A265669] p 3800 N93-32197
INTERNATIONAL ATOMIC ENERGY AGENCY, SEIBERSDORF (AUSTRIA).
Rapid instrumental and separation methods for monitoring radionuclides in food and environmental samples
[DE93-608744] p 3820 N93-31813
INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT, WASHINGTON, DC.
Towards a sustainable urban environment: The Rio de Janeiro study
[PB93-187557] p 3751 N93-31330
Indigenous views of land and the environment
[PB93-186898] p 3755 N93-32166
Information systems strategies for public financial management
[PB93-186948] p 3842 N93-32167
INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS, TRIESTE (ITALY).
Case studies in the numerical solution of oscillatory integrals
[DE92-642554] p 3801 N93-31067
Global stability of systems of two differential equations with unstationary nonlinearities, 2
[DE92-642558] p 3802 N93-31072
Periodic x ray flares of NGC 6814: Gravitational lensing of an accreting neutron star?
[DE92-642586] p 3851 N93-31073
Ashtekar variables, self-dual metrics, and w(infinity)
[DE92-642588] p 3802 N93-31074
String-like excitations in quantum electrodynamics
[DE92-642593] p 3830 N93-31075
Dissipation and convergence in the systems of differential equations with unstationary nonlinearities
[DE92-642559] p 3802 N93-31079
2 + 1 gravity without dynamics
[DE92-642587] p 3757 N93-31081
Intuitive approach to modified gyrokinetic equation and numerical confirmation
[DE93-604671] p 3812 N93-31083
Are there missing convective currents?
[DE93-604672] p 3825 N93-31084
The thermodynamic and structural contributions to the vacancy formation energies in hot rare gas solids
[DE93-604742] p 3827 N93-31086
Local order and concentration fluctuations in K-Pb and Rb-Pb alloys
[DE93-606725] p 3704 N93-31093
On the magnetoresistance of heavy fermion compounds
[DE93-608691] p 3827 N93-31098
Nonlinear response function for two-phonon polaritons
[DE93-608692] p 3817 N93-31099
Exciton solitary waves in molecular crystals
[DE93-608693] p 3827 N93-31100
Normal forms of invariant vector fields under a finite group action
[DE93-604134] p 3813 N93-31102
Numerical evidence for two types of localized states in a two-dimensional disordered lattice
[DE92-642677] p 3827 N93-31159
Differential inclusions governed by convex and nonconvex perturbation of a sweeping process
[DE92-644668] p 3802 N93-31160
Spontaneous regulating mechanisms that may have led to the origin of life
[DE93-603677] p 3771 N93-31161
Multiparametric quantum symplectic phase space
[DE93-604081] p 3802 N93-31162
Microscopic origin of marginal Fermi-liquid in strongly correlated spin systems
[DE93-608697] p 3827 N93-31163
New edge magnetoplasmon for a two-dimensional electron gas in a ring geometry
[DE93-608737] p 3825 N93-31164
Existence of viable solutions for nonconvex-valued differential inclusions in Banach spaces
[DE92-644669] p 3803 N93-31285
Calculations of wavefunctions and energies of electron system in Coulomb potential by variational method without a basis set
[DE93-608161] p 3819 N93-31286
Information-theoretic outlook of the quantum dissipation problem
[DE93-608162] p 3831 N93-31287
The nth roots with Hilbert-Schmidt defect operator of normal contractions
[DE93-608163] p 3803 N93-31288
The three-body problem in the ground-state representation
[DE93-608164] p 3803 N93-31289
Information-theoretic and Wigner function approaches to the nonclassical states dynamics for the variable frequency harmonic oscillator
[DE93-608166] p 3813 N93-31301
Instabilities and nonstatistical behavior in globally coupled systems
[DE93-608185] p 3831 N93-31302
Biharmonic pattern selection
[DE93-608186] p 3803 N93-31303
Radiation reaction for the classical relativistic spinning particle in scalar, tensor and linearized gravitational fields
[DE93-608191] p 3757 N93-31304
BRST cohomology ring in 2D gravity coupled to minimal models
[DE93-608192] p 3757 N93-31305

On the scalar curvature of self-dual manifolds
[DE93-608194] p 3804 N93-31306
Distribution function of excitations in systems with fractional statistics
[DE93-608195] p 3810 N93-31307
A note on the Dirac canonical quantization of massive Yang-Mills theory
[DE93-608199] p 3813 N93-31460
The constraint for the lowest Landau level and the effective field theory approach for the fractional quantum hall system
[DE93-608200] p 3831 N93-31509
A 17 keV neutrino and large magnetic moment solution of the solar neutrino puzzle
[DE93-608264] p 3819 N93-31662
Radiative electroweak breaking and sparticle spectroscopy with tan(beta) is approximately equal to (m(sub t)) divided by (m(sub b))
[DE93-608399] p 3832 N93-31663
Electronic Landau levels in quantum wells with periodically structured interfaces
[DE93-608514] p 3828 N93-31664
The Optical Stark effect of the exciton due to dynamical coupling between quantized states of the electron and hole in quantum wells
[DE93-608520] p 3819 N93-31665
Chaotic dynamics of high density photon and exciton system
[DE93-608522] p 3819 N93-31666
Nonlinear radiation of waves at combination frequencies due to radiation-surface wave interaction in plasmas
[DE93-608570] p 3825 N93-31667
Kinetic nonlinear electron-ion two stream instability in field-free isothermal plasma
[DE93-608571] p 3826 N93-31668
Excitonic bistabilities, instabilities and chaos in laser-pumped semiconductor
[DE93-608677] p 3731 N93-31669
Computer simulation of energy profiles in a plasma focus device
[DE93-608560] p 3826 N93-31673
Relaxational dynamics and precursor domains in the non-linear shell model
[DE92-642676] p 3820 N93-31805
Nonclassical disordered phase in the strong quantum limit of frustrated antiferromagnets
[DE92-645691] p 3815 N93-31806
Three lectures on quantum groups: Representations, duality, real forms
[DE93-608159] p 3832 N93-31807
Q-deformed conformal superalgebra and its Hopf subalgebras
[DE93-608160] p 3807 N93-31808
Lepton-quark families, cosmic strings and democratic mass matrix
[DE93-608263] p 3832 N93-31809
Lie bialgebras with triangular decomposition
[DE93-604232] p 3808 N93-31820
Theory of deep-inelastic scattering reactions and x-rescaling model
[DE93-604519] p 3820 N93-31821
Excitation of atomic hydrogen
[DE93-604639] p 3820 N93-31822
On the superconductivity existence within the Hubbard model
[DE93-613987] p 3830 N93-32280
On the real symmetric inverse eigenvalue problem
[DE93-619667] p 3809 N93-32284
A remark about the mean curvature
[DE93-619668] p 3809 N93-32285
Finite-dimensional approximation for operator equations of Hammerstein type
[DE93-619669] p 3809 N93-32286
Convergence rates and finite-dimensional approximations for nonlinear ill-posed problems involving monotone operators in Banach spaces
[DE93-619670] p 3809 N93-32287

IOWA UNIV., IOWA CITY.
Automated failure mode effects and criticality analyses for reliability prediction of multibody mechanical systems p 3738 N93-31107
Analysis of Uranian radio emissions, Uranus Data Analysis Program (UDAP)
[NASA-CR-193524] p 3882 N93-32222

ITALIAN AIR FORCE PRATICA DI MARE, ROME.
Idiopathic Reactive Hypoglycemia in a population of healthy trainees of an Italian Air Force military school p 3779 N93-32248
Cardiovascular risk factors in an Italian Air Force population: Preliminary report p 3775 N93-32252

J

JAPAN ATOMIC ENERGY RESEARCH INST., TOKYO.
Tokamak plasma shape identification based on the boundary integral equations
[DE93-715383] p 3825 N93-31097
A plotting system for three-dimensional oblique coordinates (triangular mesh) of CITATION
[DE92-526848] p 3792 N93-32185

JAPAN SPACE UTILIZATION PROMOTION CENTER, TOKYO.
Prometheus in space: Survey report of Research Committee on Functional New Material p 3710 N93-31728

JET PROPULSION LAB., CALIFORNIA INST. OF TECH., PASADENA.
CELIAS: Charge, Element and Isotope Analysis System for the SOHO mission p 3860 N93-31725
Prospects for imaging and astrometry on the ground and implications for space interferometry p 3848 N93-31776
Remote surface inspection system p 3739 N93-32099
Supervisory autonomous local-remote control system design: Near-term and far-term applications p 3801 N93-32100
Man-machine cooperation in advanced teleoperation p 3784 N93-32106
Interactive and cooperative sensing and control for advanced teleoperation p 3784 N93-32108
Satellite Test Assistant Robot (STAR) p 3690 N93-32111
Planetary rover developments at JPL p 3737 N93-32115
Graphics simulation and training aids for advanced teleoperation p 3793 N93-32119
Potential low-cost telerobotics flight experiments p 3737 N93-32120
Attention focussing and anomaly detection in real-time systems monitoring p 3730 N93-32139
Using machine learning techniques to automate sky survey catalog generation p 3843 N93-32143
Intelligent assistance in scientific data preparation p 3843 N93-32144
Process control and recovery in the Link Monitor and Control Operator Assistant p 3719 N93-32145
Automation and hypermedia technology applications p 3843 N93-32155

JOINT INST. FOR NUCLEAR RESEARCH, DUBNA (USSR).
Mathematical simulation of the induced gamma-radiation in structural materials of spaceships
[DE93-606751] p 3688 N93-31076
The determination of the thickness of the film materials by the PIXE method
[DE93-607555] p 3823 N93-31090
SQUIDs in thermal detectors of weakly interacting particles
[DE93-609531] p 3729 N93-31247

K

KAISERSLAUTERN UNIV. (GERMANY).
Excitation by flows in seals and clearances. Part 1: Introduction: Fluid-structure-interactions in rotordynamics. Part 2: Identification of rotordynamic coefficients of annular seals p 3738 N93-32275

KAMAN SCIENCES CORP., COLORADO SPRINGS, CO.
Statistics of mass production
[AD-A264365] p 3715 N93-31867
Validation of survivability validation protocols
[AD-A264402] p 3791 N93-32034

KESTREL INST., PALO ALTO, CA.
Knowledge-based software development tools
[AD-A265218] p 3791 N93-32059

KIEL UNIV. (GERMANY).
COSTEP: Comprehensive suprathermal and energetic particle analyser for SOHO: Scientific goals and data description p 3869 N93-31353
Influence of interplanetary shocks on approximately 10 MeV protons: A phenomenological classification p 3854 N93-31686

KITT PEAK NATIONAL OBSERVATORY, TUCSON, AZ.
Visible and infrared imaging interferometry from space p 3844 N93-31753
Space Interferometry Science Working Group p 3846 N93-31761

KOREAN ATOMIC ENERGY RESEARCH INST., DAEDUK (REPUBLIC OF KOREA).
The development of detection technique for fatigue crack due to thermal stratification phenomena in RCS piping
[DE93-605749] p 3740 N93-31823
Study on laser atomic spectroscopy
[DE93-606193] p 3703 N93-31824
A study on the development of high T(sub c) superconducting materials
[DE93-606394] p 3720 N93-31825
Applications of optical fiber to remote laser fluorescence analysis
[DE93-607553] p 3732 N93-31826
Study on the improvement of the properties of Zr alloys
[DE93-605265] p 3706 N93-31827
The development of SiC whisker fabrication technology for nuclear applications
[DE93-605320] p 3710 N93-31828
Pulse holographic measurement techniques
[DE93-607634] p 3729 N93-31835

L

LABORATOIRE D'AUTOMATIQUE ET D'ANALYSE DES SYSTEMES, TOULOUSE (FRANCE).
Feasibility of piezoresistive pressure sensors with polycrystalline silicon gauges
[LAAS-92324] p 3728 N93-31127
Synthesis and realization of a monolithic active bandpass filter for the Ku band
[LAAS-92365] p 3719 N93-31173

LAMONT-DOHERTY GEOLOGICAL OBSERVATORY, PALISADES, NY.
Airborne gravity and other geophysical techniques for understanding the lithosphere beneath the West Antarctic Ice Sheet p 3761 N93-31894
Recent changes of weather patterns in North America
[DE93-013982] p 3769 N93-32289

LAWRENCE LIVERMORE NATIONAL LAB., CA.
Unclassified satellite remote sensing as a component of integrated treaty verification
[DE93-005736] p 3744 N93-31187
New architectures to reduce I/O bottlenecks in high-performance systems
[DE93-009059] p 3795 N93-31985
Experiences with different parallel programming paradigms for Monte Carlo particle transport leads to a portable toolkit for parallel Monte Carlo
[DE93-009061] p 3796 N93-31986
Temperature dependence of the femtosecond optical response in doped high temperature superconductors
[DE93-009514] p 3829 N93-31988
Integration of measurements with atmospheric dispersion models: Source term estimation for dispersal of (239)Pu due to non-nuclear detonation of high explosive
[DE93-012550] p 3766 N93-32295
Single crystal tungsten kinetic energy penetrators
[DE93-012570] p 3706 N93-32296
Coupled ocean-atmosphere GCM simulation of Southern Oscillation phenomena
[DE93-012583] p 3766 N93-32297

LENINGRAD STATE UNIV. (USSR).
Time-varying reconnection in a stagnation-point flow geometry p 3827 N93-31697

LIEGE UNIV. (BELGIUM).
Photospheric abundances p 3878 N93-31408
Vibration analysis in turbomachines p 3683 N93-32274

LOCKHEED AIRCRAFT CORP., PALO ALTO, CA.
Observations of the quiet Sun from the soft x ray telescope on Yohkoh p 3874 N93-31388

LOGISTICS MANAGEMENT INST., BETHESDA, MD.
Making clean gasoline: The effect on jet fuels
[AD-A264302] p 3713 N93-32085

LONDON UNIV. (ENGLAND).
Ion acceleration at parallel shocks: Self-consistent plasma simulations p 3826 N93-31683

LOS ALAMOS NATIONAL LAB., NM.
The Thermionic Fuel Element Verification Program: Technical progress and future plans
[DE93-003797] p 3691 N93-31185
NTO polymorphs
[DE93-005451] p 3712 N93-31186
Theory of coronal streamer formation p 3869 N93-31355
A continuation method for computing non-linear 3-D free surface flows
[DE93-008704] p 3727 N93-32175
Proceedings of the First Geological Materials Constitutive Modeling Workshop
[DE93-009161] p 3765 N93-32176
Ceramics models in the MESA codes
[DE93-000683] p 3711 N93-32186
Manipulating remotely-sensed data with Khoros
[DE93-012622] p 3842 N93-32298
Genetic algorithms for DNA sequence assembly
[DE93-012708] p 3792 N93-32299

Some outstanding issues in pion scattering at energies above the (delta) resonance
[DE93-012747] p 3622 N93-32300

LOUGHBOROUGH UNIV. OF TECHNOLOGY (ENGLAND).
A first approximation to the effects of mean flow on sound propagation through cylindrical capillary tubes
[MATHS-REPT-A-181] p 3815 N93-31599
Generalised curvature continuous rational cubics
[MATHS-REPT-A-180] p 3809 N93-32347

LUDWIG-MAXIMILIANS-UNIV., MUNICH (GERMANY).
Frequency of the chemical elements in B-stars of the local field and dispersion of interstellar medium
[ETN-93-94205] p 3852 N93-31091
Climatic effects of turbofan emissions in the stratosphere and the higher troposphere p 3753 N93-31927

LUNAR AND PLANETARY INST., HOUSTON, TX.
MSATT Workshop on Chemical Weathering on Mars
[NASA-CR-193209] p 3861 N93-31933

M

MAIN ASTRONOMICAL OBSERVATORY, KIEV (UKRAINE).
On the Bernstein modes generation in solar post-flare loops p 3859 N93-31718
Nonlinear interaction of Alfven waves in solar atmosphere p 3860 N93-31724

MAINE UNIV., ORONO.
Modeling ice streams: Derived quantities p 3763 N93-31904

MARTIN MARIETTA CORP., DENVER, CO.
Implications for volcanogenic volatile release on the weathering of Mars p 3862 N93-31939

MARTIN MARIETTA CORP., WASHINGTON, DC.
Maglev guideway route alignment and right-of-way requirements
[PB93-154854] p 3735 N93-31592
Maglev guideway and route integrity requirements
[PB93-154870] p 3736 N93-32086
Maglev program test plan
[PB93-154904] p 3736 N93-32194

MARYLAND UNIV., COLLEGE PARK.
On the feasibility of a transient dynamic design analysis
[AD-A264882] p 3733 N93-31101
Transient cooling of a hot surface by droplets evaporation
[PB93-189421] p 3722 N93-31114
Radio observations of coronal streamers p 3870 N93-31359
Observations of stationary radio sources: Coronal polar plumes? p 3871 N93-31365
Models of coronal streamers at meter-decameter wavelengths p 3872 N93-31374
3D reconstruction methods of coronal structures by radio observations p 3874 N93-31387
Potential roles for EVA and telerobotics in a unified worksite p 3690 N93-32118
Massively parallel support for a case-based planning system p 3797 N93-32135
Cooperative answers in database systems p 3843 N93-32153

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Cut locus and medial axis in global shape interrogation and representation
[PB93-189884] p 3786 N93-31199
Low cost guideways to Maglev
[PB93-154847] p 3735 N93-31727
Searching for exoplanets p 3846 N93-31760
Adaptive array processing in uncertain inhomogeneous media 1992-1993
[AD-A265256] p 3717 N93-31794
Dehydroxylated clay silicates on Mars: Riddles about the Martian regolith solved with ferrian saponites p 3862 N93-31937
The fate of iron on Mars: Mechanism of oxidation of basaltic minerals to ferric-bearing assemblages p 3862 N93-31938
Polametric passive remote sensing of ocean surface
[AD-A265874] p 3746 N93-32173
Interactions between magnetically levitated vehicles and elevated guideway structures
[PB93-148542] p 3736 N93-32192

MASSACHUSETTS INST. OF TECH., LEXINGTON.
Space qualification for an intersatellite laser communications system
[AD-A265145] p 3717 N93-31989
The application of synthetic-beacon technology to astronomy
[AD-A265146] p 3850 N93-31990

MASSACHUSETTS UNIV., GLOUCESTER.
Photoconductivity and photovoltage generation in novel photocrosslinkable nonlinear optical polymers
[AD-A265780] p 3750 N93-32417

MASSACHUSETTS UNIV., LOWELL.
Cerenkov type phase-matched second harmonic generation in polymeric channel waveguides
[AD-A265787] p 3710 N93-31801
Functionalized polymeric materials for electronics and optics
[AD-A265788] p 3710 N93-31802

MATERIALS AND ELECTROCHEMICAL RESEARCH CORP., TUCSON, AZ.
The development of a tungsten heavy alloy that fails by an adiabatic shear mechanism, phase 1
[AD-A265867] p 3707 N93-32318

MATERIALS RESEARCH LABS., MARIBYRNONG (AUSTRALIA).
Commissioning and operating instructions of one pint (US) mixer
[MRL-TN-634] p 3713 N93-31639

MATERIALS RESEARCH SOCIETY, PITTSBURG, PA.
Structure and properties of energetic materials
[AD-A265775] p 3713 N93-31800

MAX-PLANCK-INST. FUER AERONOMIE, KATLENBURG-LINDAU (GERMANY).
Observation of particle bursts in the tail of planet Mars onboard the Phobos 2 spacecraft p 3856 N93-31699
On the solar wind-magnetosphere-ionosphere coupling: AMPTE/CCE particle data and the AE indices p 3856 N93-31701
Origin of the solar wind and coronal mass ejections p 3856 N93-31702
Spectra and structure functions of temperature fluctuations in the inner solar wind p 3860 N93-31720

MAX-PLANCK-INST. FUER CHEMIE, MAINZ (GERMANY).
On the weathering of Martian igneous rocks p 3862 N93-31941

MAX-PLANCK-INST. FUER EXTRATERRESTRISCHE PHYSIK, BERLIN (GERMANY).
Role of the INTERBALL small scale investigations in the GGS program p 3859 N93-31717

MAX-PLANCK-INST. FUER EXTRATERRESTRISCHE PHYSIK, GARCHING (GERMANY).
The Charge, Element, and Isotope Analysis System CELIAS on SOHO p 3869 N93-31352
Report of the submillimeter splinter group p 3847 N93-31770

MAX-PLANCK-INST. FUER PHYSIK UND ASTROPHYSIK, GARCHING (GERMANY).
Momentum transport through the chromosphere p 3852 N93-31677
Quasi-parallel shock re-formation: Two-dimensional simulations p 3826 N93-31682
A new method for measuring the speed of the bow shock p 3854 N93-31687
Plasma transport through magnetic boundaries p 3827 N93-31692
Collisionless magnetotail reconnection and substorms p 3856 N93-31698

MCDONNELL-DOUGLAS ELECTRONICS CO., SAINT LOUIS, MO.
Use of titanium castings without a casting factor
[AD-A264414] p 3705 N93-31192

MCDONNELL-DOUGLAS SPACE SYSTEMS CO., COCOA BEACH, FL.
Path planning control p 3685 N93-31451
Ground Robotic Hand Applications for the Space Program study (GRASP)
[NASA-CR-193571] p 3737 N93-32235

MCDONNELL-DOUGLAS SPACE SYSTEMS CO., HOUSTON, TX.
Proximity operations in space station environment p 3689 N93-31449
Rendezvous guidance p 3689 N93-31450
Active damping in a flexible manipulator p 3689 N93-31452
Tethered systems control p 3689 N93-31453
Hyperbaric treatment p 3689 N93-31454
Daily exercise routines p 3689 N93-31455
Implementing a real time reasoning system for robust diagnosis p 3739 N93-32138

MCDONNELL-DOUGLAS SPACE SYSTEMS CO., HUNTINGTON BEACH, CA.
Workshop on Fuzzy Control Systems and Space Station Applications
[NASA-CR-193202] p 3688 N93-31439
Space Station Freedom attitude determination and control system overview p 3689 N93-31447
Blowdown thrust profile prediction p 3689 N93-31448
Atmospheric control systems p 3689 N93-31456
Rotational speed control p 3689 N93-31457
Vibration isolation p 3690 N93-31458

MEDIA LOGIC, INC., PLAINVILLE, MA.
Recording and wear characteristics of 4 and 8 mm helical scan tapes p 3730 N93-31969

MELBOURNE UNIV., CARLTON (AUSTRALIA).
A universal mass in (2+1)-dimensions
[DE93-609888] p 3832 N93-31911

MELBOURNE UNIV., PARKVILLE (AUSTRALIA).
Carbon diffusion in uncoated and titanium nitride coated iron substrates during microwave plasma assisted chemical vapor deposition of diamond
[DE93-608934] p 3708 N93-31174
Hierarchical textures in ferroelectric crystals
[DE93-608938] p 3827 N93-31175
HREM study of crystallography of titanium and titanium hydride thin films
[DE93-609038] p 3828 N93-31176
Thermodynamic analysis of processes proceeding on (111) faces of diamond during chemical vapour deposition
[DE93-609039] p 3708 N93-31177
Investigation of carbon near the graphite-diamond-liquid triple point
[DE93-609052] p 3708 N93-31178
Measurement of the spatial coherence of a soft x ray laser
[DE93-609404] p 3731 N93-31227
An electrostatic mirror for neutral polar molecules
[DE93-609405] p 3818 N93-31228
A self-aligning interferometer suitable for white or monochromatic light consisting solely of a mirror and a reflection grating, part 2
[DE93-609517] p 3823 N93-31246
Relativistic band gaps in one-dimensional disordered systems
[DE93-609841] p 3829 N93-31814
Hamiltonian moments and the Lanczos method in the Heisenberg model
[DE93-609845] p 3813 N93-31905
Plaquette expansion in lattice Hamiltonian models
[DE93-609846] p 3813 N93-31906
Wavefront reconstruction from three dimensional intensity measurements
[DE93-609881] p 3832 N93-31909
Random walks and a simple chirally invariant lattice Hamiltonian without fermion doubling
[DE93-609920] p 3821 N93-31913
Scalar symmetry of the massless Dirac equation
[DE93-609921] p 3832 N93-31914
Massive neutrinos
[DE93-609989] p 3821 N93-32026
Proposal for an absolute, atomic definition of mass
[DE93-609842] p 3815 N93-32410
A unified approach to classical and quantum physics
[DE93-609843] p 3833 N93-32411

MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., MUNICH (GERMANY).
Advanced aircraft with thrust vector control
[MBB-FE-1-S-PUB-0504] p 3678 N93-31043
Consideration of impact damages by dimensioning CFC (Carbon Fiber Reinforced Composites) components
[MBB-FE-221-S-PUB-0501] p 3699 N93-31044
Technology transfer: Potential of BMFT concept for hypersonics
[MBB-LME-202-S-PUB-0505] p 3843 N93-31045
Development of nose structure of a reconnaissance container for a supersonic jet aircraft
[MBB-LME-242-S-PUB-0451] p 3679 N93-31046
Aircraft structures in 2000: A technological challenge?
[MBB-LME-202-S-PUB-0485] p 3679 N93-31058

MICHIGAN TECHNOLOGICAL UNIV., HOUGHTON.
Global synchronization algorithms for the Intel iPSC/860
[NASA-CR-193618] p 3793 N93-32361

MICHIGAN UNIV., ANN ARBOR.
Estimation and control in discrete-time nonlinear systems p 3797 N93-31071

MIDWEST RESEARCH INST., GOLDEN, CO.
Large-area, triple-junction a-Si alloy production scale-up
[DE93-010007] p 3750 N93-32177
International Energy Agency Solar Heating and Cooling Program
[DE93-010175] p 3750 N93-32282
Cutting parameters with Lasag lasers
[DE93-010403] p 3732 N93-32288

MINISTRY OF EDUCATION AND RESEARCH, COPENHAGEN (DENMARK).
Integrated access to distributed databases through intelligent interfaces p 3837 N93-31218

MINNESOTA UNIV., MINNEAPOLIS.
Investigations into database management system support for expert system shells, volumes 1 and 2 p 3835 N93-31108
Linear algebra for signal processing
[AD-A264677] p 3808 N93-32017

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE.
Data communication network at the ASRM facility
[NASA-CR-193625] p 3686 N93-32236

MISSOURI UNIV., ROLLA.
NMR studies of organic thin films
[AD-A264903] p 3707 N93-31066
The management of replicated data
p 3836 N93-31144
MITRE CORP., BEDFORD, MA.
Performance measures of parallel digital signal processor systems
[AD-A265804] p 3718 N93-32313
MOBIL TYCO SOLAR ENERGY CORP., BILLERICA, MA.
Cutting parameters with Lasag lasers
[DE93-010403] p 3732 N93-32288
MONTANA STATE UNIV., BOZEMAN.
Mode hopping in semiconductor lasers
p 3731 N93-31131

N

NASA CENTER FOR AEROSPACE INFORMATION, BALTIMORE-WASHINGTON INTERNATIONAL AIRPORT, MD.
Newly available technologies present expanding opportunities for scientific and technical information exchange p 3837 N93-31217
NATIONAAL INST. VOOR KERNFYSICA EN HOGE ENERGIEFYSICA, AMSTERDAM (NETHERLANDS).
The ZEUS uranium calorimeter: Main characteristics and first operating experience
[NIKHEF-H/92-15] p 3728 N93-31117
BRST quantization of 2D-Yang Mills theory with anomalies
[NIKHEF-H/92-13] p 3831 N93-31122
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, DC.
NASA aerospace pyrotechnically actuated systems: Program plan
[NASA-TM-109226] p 3712 N93-31308
Fusion energy for space: Feasibility demonstration. A proposal to NASA
[NASA-TM-109227] p 3825 N93-31309
Inertial electrostatic confinement as a power source for electric propulsion
[NASA-TM-109228] p 3692 N93-31310
NASA Engineering and Technology Advancement Office: A proposal to the administrator
[NASA-TM-109229] p 3685 N93-31312
Modernization and new technologies: Coping with the information explosion
[NASA-TM-109410] p 3838 N93-31315
Design for a complete SOHO mission under the ISTP
p 3880 N93-31424
Fuzzy Control/Space Station automation
p 3688 N93-31440
Science Information Systems Newsletter, issue 28
[NASA-TM-108266] p 3834 N93-31589
NASA patent abstracts bibliography: A continuing bibliography. Section 1: Abstracts (supplement 43)
[NASA-SP-7039(43)-SECT-1] p 3839 N93-31923
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 377)
[NASA-SP-7011(377)] p 3773 N93-31924
Aeronautical engineering: A continuing bibliography with indexes (supplement 292)
[NASA-SP-7037(292)] p 3671 N93-32375
NASA patent abstracts bibliography: A continuing bibliography. Section 2: Indexes (supplement 43)
[NASA-SP-7039(43)-SECT-2] p 3842 N93-32376
Coordinating Council. Tenth Meeting: Information retrieval: The role of controlled vocabularies
[NASA-TM-108764] p 3843 N93-32403
European aerospace science and technology, 1992: A bibliography with indexes
[NASA-SP-7105] p 3671 N93-32404
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CA.
The mineralogy and formation processes of Mars soil
p 3861 N93-31934
Martian weathering/alteration scenarios from spectral studies of ferric and ferrous minerals
p 3862 N93-31935
Mars brine formation experiment
p 3864 N93-31949
Infrared optical properties of Mars soil analog materials: Palagonites p 3866 N93-31957
Chemical reactivity of the Martian soil
p 3867 N93-31963
Generation and exploration of aggregation abstractions for scheduling and resource allocation
p 3835 N93-32128
The computer integrated documentation project: A merge of hypermedia and AI techniques
p 3801 N93-32148
Applications of structural optimization methods to fixed-wing aircraft and spacecraft in the 1980s
[NASA-TM-103939] p 3740 N93-32212
Flight evaluation of a computer aided low-altitude helicopter flight guidance system
[NASA-TM-103998] p 3678 N93-32225
Selected experiments in laminar flow: An annotated bibliography
[NASA-TM-103989] p 3673 N93-32226
Expansion-based passive ranging
[NASA-TM-104025] p 3678 N93-32348
Analytical and experimental investigations of the oblique detonation wave engine concept
[NASA-TM-102839] p 3683 N93-32374
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.
Split rail gripper assembly and tool driver therefor
[NASA-CASE-GSC-13370-1] p 3734 N93-31317
SUMER: Temperatures, densities, and velocities in the outer solar atmosphere p 3867 N93-31346
Solar corona synoptic observations from SOHO with an extreme ultraviolet imaging telescope
p 3868 N93-31348
Speeds and accelerations of coronal mass ejections
p 3871 N93-31368
Sungrazing comet observations associated with SOHO
p 3871 N93-31369
Active region studies with coordinated SOHO, microwave, and magnetograph observations
p 3873 N93-31380
Observations of the solar corona with a high resolution EUV imaging spectrograph p 3875 N93-31390
Underneath coronal loops: MSDP observations coordinated with SERTS 4 and NIXT flights
p 3876 N93-31397
Energetic particle observations and the abundances of elements in the solar corona p 3878 N93-31410
Coronal abundances in solar active regions measured by the Solar Maximum Mission flat crystal spectrometer
p 3879 N93-31416
Hitchhiker: Customer Accommodations and Requirements Specifications (CARS)
[NASA-TM-109225] p 3834 N93-31644
Distinct ion population in the polar cusp: Possible signature of transient reconnection
p 3766 N93-31680
Plasma wave phenomena observed at interplanetary shocks by the Ulysses URAP experiment
p 3826 N93-31684
Model of a rotating magnetic cloud
p 3857 N93-31707
Spectral classification with the International Ultraviolet Explorer: An atlas of B-type spectra
[NASA-RP-1312] p 3861 N93-31737
SeaWiFS technical report series. Volume 10: Modeling of the SeaWiFS solar and lunar observations
[NASA-TM-104566-VOL-10] p 3770 N93-31859
The First Annual West Antarctic Ice Sheet (WAIS) Science Workshop
[NASA-CP-3222] p 3758 N93-31878
The mass balance of the ice plain of Ice Stream B and Crary Ice Rise p 3760 N93-31888
The Martian ocean: First acid, then alkaline
p 3866 N93-31958
Goddard Conference on Mass Storage Systems and Technologies, volume 2
[NASA-CP-3198-VOL-2] p 3839 N93-31964
Accessing Earth science data from the EOS data and information system p 3840 N93-31968
Architectural assessment of mass storage systems at GSFC p 3841 N93-31980
An on-line expert system for diagnosing environmentally induced spacecraft anomalies using CLIPS
p 3794 N93-32142
SeaWiFS Technical Report Series. Volume 4: An analysis of GAC sampling algorithms: A case study
[NASA-TM-104566-VOL-4] p 3771 N93-32360
ESTAR: The Electronically Scanned Thinned Array Radiometer for remote sensing measurement of soil moisture and ocean salinity
[NASA-TM-4523] p 3747 N93-32362
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. HUGH L. DRYDEN FLIGHT RESEARCH FACILITY, EDWARDS, CA.
Engine exhaust characteristics evaluation in support of aircraft acoustic testing
[NASA-TM-104263] p 3682 N93-32220
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TX.
Terminology and concepts of control and Fuzzy Logic
p 3688 N93-31443
Location of nanophase Fe-oxides in palagonitic soils: Implication for Martian pigments p 3863 N93-31943
Aqueous geochemistry on Mars: Possible clues from salts and clays in SNC meteorites p 3863 N93-31944
Effect of DCB extraction on Mossbauer and spectral data for a Hawaiian palagonitic soil (PN-9): Iden tification of pigmentary phases p 3864 N93-31950
Geochemistry and setting of Martian weathering: The Lafayette meteorite p 3866 N93-31961
The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992)
[NASA-CP-3187-VOL-1] p 3883 N93-32097
Sensor fusion for assured vision in space applications
p 3824 N93-32105
Integration of advanced teleoperation technologies for control of space robots p 3784 N93-32107
JSC flight experiment recommendation in support of Space Station robotic operations p 3691 N93-32121
An overview of the Kennedy Space Center robotics program p 3691 N93-32124
DESSY: Making a real-time expert system robust and useful p 3794 N93-32146
Information for the user in design of intelligent systems p 3801 N93-32149
A decision-theoretic approach to the display of information for time-critical decisions: The Vista project
p 3784 N93-32152
Software engineering p 3794 N93-32154
Space Shuttle Orbiter thermal protection system design and flight experience
[NASA-TM-104773] p 3727 N93-32198
Health maintenance facility system effectiveness testing
[NASA-TM-104737] p 3783 N93-32328
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, HAMPTON, VA.
Reusable cryogenic liquid rocket propellant tank
[NASA-CASE-LAR-14172-1] p 3692 N93-31295
Two-stage gas measurement system
[NASA-CASE-LAR-14791-1] p 3729 N93-31297
Phenylethynyl endcapping reagents and reactive diluents
[NASA-CASE-LAR-14796-1] p 3702 N93-31459
Reynolds number influences in aeronautics
[NASA-TM-107730] p 3673 N93-31732
Supersonic aerodynamic characteristics of an advanced F-16 derivative aircraft configuration
[NASA-TP-3355] p 3673 N93-31733
Automatic specification of reliability models for fault-tolerant computers
[NASA-TP-3301] p 3812 N93-31869
Automated assembly of large space structures using an expert system executive p 3690 N93-32102
Performance analysis of a large-grain dataflow scheduling paradigm
[NASA-TP-3323] p 3796 N93-32213
Airborne derivation of microburst alerts from ground-based Terminal Doppler Weather Radar information: A flight evaluation
[NASA-TM-108990] p 3680 N93-32223
A PC-based simulation of the National Transonic Facitity's safety microprocessor
[NASA-TM-109003] p 3796 N93-32224
A decoupled control approach for magnetic suspension systems using electromagnets mounted in a planar array
[NASA-TM-109011] p 3715 N93-32227
Geometric model from microscopic theory for nuclear absorption
[NASA-TP-3324] p 3822 N93-32369
The X-15/HL-20 operations support comparison
[NASA-TM-4453] p 3687 N93-32379
A high-fidelity, six-degree-of-freedom batch simulation environment for tactical guidance research and evaluation
[NASA-TM-4440] p 3684 N93-32380
Variational Trajectory Optimization Tool Set: Technical description and user's manual
[NASA-TM-4442] p 3690 N93-32381
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OH.
Minimize system cost by choosing optimal subsystem reliability and redundancy
[NASA-TM-106251] p 3812 N93-31145
Numerical simulations of three-dimensional laminar flow over a backward facing step; flow near side walls
[NASA-TM-106248] p 3723 N93-31147
Blasim: A computational tool to assess ice impact damage on engine blades
[NASA-TM-106225] p 3740 N93-31193
SiC fiber-reinforced Celsian glass-ceramic matrix composite
[NASA-CASE-LEW-15264-1] p 3700 N93-31293
Plasma sprayed ceramic thermal barrier coating for NiAl-based intermetallic alloys
[NASA-CASE-LEW-15535-1] p 3705 N93-31294

Method for producing hybrid graphite composite
[NASA-CASE-LEW-15241-2] p 3700 N93-31296
High temperature, oxidation resistant noble metal-Al alloy thermocouple
[NASA-CASE-LEW-15515-1] p 3729 N93-31298
Method of producing a ceramic fiber-reinforced glass-ceramic matrix composite
[NASA-CASE-LEW-15264-2] p 3700 N93-31299
Oxidation resistant overlay coatings for low expansion substrates
[NASA-CASE-LEW-15154-2] p 3708 N93-31300
Service equipment for use in hostile environments
[NASA-CASE-LEW-14906-2] p 3734 N93-31314
Ion exchange polymers and method for making
[NASA-CASE-LEW-15576-1] p 3709 N93-31316
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-10064] p 3692 N93-31552
Progress in the measurement of SSME turbine heat flux with plug-type sensors p 3692 N93-31553
Thin film heat flux sensor for Space Shuttle Main Engine turbine environment p 3693 N93-31554
Thin film thermocouples for high temperature turbine application p 3693 N93-31555
Rayleigh-Brillouin scattering for high-pressure gas temperature measurements p 3693 N93-31556
Neural nets for aligning optical components in harsh environments: Beam smoothing spatial filter as an example p 3693 N93-31557
Progress in speckle-shift strain measurement p 3693 N93-31558
Structural dynamics: Probabilistic structural analysis methods. Program overview p 3694 N93-31562
Mapping methods for computationally efficient and accurate structural reliability p 3695 N93-31572
Probabilistic simulation of the human factor in structural reliability p 3696 N93-31573
Overview of the fatigue/fracture/life prediction working group program at the Lewis Research Center p 3696 N93-31574
Cumulative fatigue damage behavior of MAR M-247 p 3696 N93-31575
The effect of porosity and gamma-gamma' eutectic content on the low cycle fatigue behavior of hydrogen-charged PWA-1480 p 3696 N93-31576
Secondary orientation effects in a single crystal superalloy under mechanical and thermal loads p 3696 N93-31578
A model for predicting high-temperature fatigue failure of a W/Cu composite p 3696 N93-31579
Life extending control: An interdisciplinary engineering thrust p 3697 N93-31581
Overview of aerothermodynamic loads definition study p 3697 N93-31583
Three-dimensional analysis of the Pratt and Whitney alternate design SSME fuel turbine p 3697 N93-31584
Three-dimensional flow calculations inside SSME GGGT first stage blade rows p 3697 N93-31585
Localization of aeroelastic modes in mistuned high-energy turbines p 3697 N93-31586
Measurements and computational analysis of heat transfer and flow in a simulated turbine blade internal cooling passage
[NASA-TM-106189] p 3725 N93-31647
Streamwise vorticity generation and mixing enhancement in free jets by delta-tabs
[NASA-TM-106235] p 3672 N93-31648
Lubrication of an 85-mm ball bearing with RP-1
[NASA-TM-106254] p 3686 N93-31670
Engine technology challenges for a 21st Century High-Speed Civil Transport
[NASA-TM-106216] p 3681 N93-31671
Enhanced mixing of a rectangular supersonic jet by natural and induced screech
[NASA-TM-106245] p 3672 N93-31672
Turbulence measurement in a reacting and non-reacting shear layer at a high subsonic Mach number
[NASA-TM-106186] p 3673 N93-31839
Efficient fault diagnosis of helicopter gearboxes
[NASA-TM-106253] p 3735 N93-31846
Desktop chaotic systems: Intuition and visualization
[NASA-TM-106258] p 3808 N93-31847
Combinatorial pulse position modulation for power-efficient free-space laser communications
[NASA-TM-106241] p 3717 N93-31856
NASA's progress in nuclear electric propulsion technology
[NASA-TM-106272] p 3698 N93-31858
Hypersonic engine component experiments in high heat flux, supersonic flow environment
[NASA-TM-106273] p 3726 N93-31860
A rapid-distortion-theory turbulence model for developed unsteady wall-bounded flow
[NASA-TM-106249] p 3727 N93-32199
A critical comparison of several low Reynolds number k-epsilon turbulence models for flow over a backward facing step
[NASA-TM-106173] p 3809 N93-32200
Non-destructive, ultra-low resistance, thermally stable contacts for use on shallow junction InP solar cells
[NASA-TM-106228] p 3750 N93-32201
Damping mechanisms in chemically vapor deposited SiC fibers
[NASA-TM-109236] p 3701 N93-32219
Non-contact heat flux measurement using a transparent sensor
[NASA-TM-106252] p 3713 N93-32330
Propulsion technology challenges for turn-of-the-century commercial aircraft
[NASA-TM-106192] p 3682 N93-32351
Tribological characteristics of perfluoropolyether liquid lubricants under sliding conditions in high vacuum
[NASA-TM-106257] p 3711 N93-32352
Determination of the oxidative stability of perfluoropolyalkyl ethers and correlation with chemical structure
[NASA-TM-106223] p 3712 N93-32367
Initial results from the NASA-Lewis wave rotor experiment
[NASA-TM-106148] p 3683 N93-32368
A p-version finite element method for steady incompressible fluid flow and convective heat transfer
[NASA-TM-106260] p 3727 N93-32370
Stress-rupture behavior of small diameter polycrystalline alumina fibers
[NASA-TM-106256] p 3712 N93-32382

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, AL.

Gas arc constriction for plasma arc welding
[NASA-CASE-MFS-28844-1] p 3734 N93-31292
Turntable mechanism
[NASA-CASE-MFS-28522-1] p 3734 N93-31313
Modeling solar coronal streamers p 3869 N93-31356
Predicting Ly-alpha intensities in coronal streamers p 3870 N93-31360
Microflares observed with UVSP and HXIS p 3877 N93-31405
OPAD 1991 p 3693 N93-31559
An investigation of squeeze-cast alloy 718
[NASA-TM-108412] p 3706 N93-31646
Design of multiple-ply laminated composite tapered beams
[NASA-TM-108411] p 3700 N93-31650
Evaluation of chemical conversion material (protective coating) exposed to space environmental conditions
[NASA-TM-108416] p 3730 N93-32366
Development of a large field-of-view KD potassium di-deuterium phosphate modulator: Center Director's Discretionary Fund
[NASA-TM-108410] p 3824 N93-32378

NATIONAL AEROSPACE LAB., AMSTERDAM (NETHERLANDS).

A break-down of sting interference effects
[NLR-TP-91220-U] p 3684 N93-31042
On board image processing for telescience support
[NLR-TP-91213-U] p 3823 N93-31056
Performance of gas turbine compressor cleaners
[NLR-TP-91237-U] p 3681 N93-31111
Telescience pilot experiment results using telePODI
[NLR-TP-90326-U] p 3823 N93-31118
Experiences with two GPS receivers in northern Europe
[NLR-TP-91168-U] p 3675 N93-31120
Stable numerical integration of dynamical systems subject to equality state-space constraints
[NLR-TP-91363-U] p 3802 N93-31128
Computational methods for aerodynamic design of aircraft components
[NLR-TP-92072-4] p 3671 N93-31148
Fractographic and microstructural analysis of fatigue crack growth in Ti-6Al-4V fan disc forgings p 3681 N93-31742
Low cycle fatigue behaviour of titanium disc alloys p 3682 N93-31745
Review of aerodynamic design in the Netherlands
[NLR-TP-91260-U] p 3679 N93-31840
GARTEUR compression behaviour of advanced CFRP
[NLR-TP-91290-U] p 3701 N93-32202
Ageing aircraft research in the Netherlands
[NLR-TP-91443-U] p 3679 N93-32203
Constrained motion models for insertion/extraction operations applied to the Hermes robot arm: A feasibility study
[NLR-TP-91485-U] p 3736 N93-32204
Damage severity of monitored fatigue load spectra
[NLR-TP-92009-U] p 3679 N93-32205
Instrumentation for in-flight acoustic measurements in an engine inlet duct of a Fokker 100 aircraft
[NLR-TP-91200-U] p 3680 N93-32332
Modified dynamics modelling for maneuvering flexible space manipulators
[NLR-TP-91280-U] p 3737 N93-32333
The application of phase tracking GPS for flight test trajectory determination
[NLR-TP-91349-U] p 3678 N93-32337
Development of a method to predict transonic limit cycle oscillation characteristics of fighter aircraft
[NLR-TP-91359-U] p 3679 N93-32338
Panel methods for aerodynamic analysis and design
[NLR-TP-91404-U] p 3674 N93-32357
NLR inviscid transonic unsteady loads prediction methods in aeroelasticity
[NLR-TP-91410-U] p 3674 N93-32358
Low cycle fatigue behaviour of titanium disc alloys
[NLR-TP-91346-U] p 3683 N93-32372
Accelerated and real-time corrosion testing of aluminum-lithium alloys
[NLR-TP-91203-U] p 3707 N93-32385
Transmission of sound through a rotor
[NLR-TP-92014-U] p 3683 N93-32386
Towards distributed control systems for experiments under micro gravity
[NLR-TP-92027-U] p 3714 N93-32387
Evaluation of the flyability of MLS curved approaches for wide-body aircraft
[NLR-TP-91396-U] p 3680 N93-32416

NATIONAL AEROSPACE LAB., MARKNESSE (NETHERLANDS).

A new view of the sea
[ETN-93-93469] p 3747 N93-32345

NATIONAL AEROSPACE LAB., TOKYO (JAPAN).

Low-speed wind tunnel study of the direct side-force characteristics of a joined-wing airplane with an upper fin
[DE93-767966] p 3672 N93-31189

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH, BOULDER, CO.

Measurement uncertainties of the NCAR air motion systems
[PB93-184208] p 3764 N93-32068

NATIONAL COMPUTING CENTRE LTD., MANCHESTER (ENGLAND).

COBOL Compiler Validation System (CCVS 85), user guide, version 4.2
[PB93-163178] p 3785 N93-31112

NATIONAL DEFENCE RESEARCH ESTABLISHMENT, UMEA (SWEDEN).

Micro-organisms, cytotoxins and radioactive preparation: Risks at rescue operations in hospital environment
[FOA-A-40065-4.5] p 3772 N93-32423
Atmospheric dispersion of air pollutants in Umea (Sweden)
[FOA-C-40300-4.5] p 3756 N93-32424

NATIONAL GEOPHYSICAL DATA CENTER, BOULDER, CO.

Solar-geophysical data number 583, March 1993. Part 1: (Prompt reports). Data for February, January 1993, and late data
[PB93-188894] p 3881 N93-31436
Solar-geophysical data number 583, March 1993. Part 2: (Comprehensive reports). Data for September 1992 and miscellaneous
[PB93-188902] p 3881 N93-31437

NATIONAL INST. OF RADIOLOGICAL SCIENCES, CHIBA (JAPAN).

Annual report of the National Institute of Radiological Sciences
[DE93-704237] p 3820 N93-31810

NATIONAL INST. OF STANDARDS AND TECHNOLOGY, GAITHERSBURG, MD.

Metrication: An economic wake-up call for US industry
[PB93-188969] p 3714 N93-31109
COBOL Compiler Validation System (CCVS 85), user guide, version 4.2
[PB93-163178] p 3785 N93-31112
Measurement uncertainty considerations for coordinate measuring machines
[PB93-189819] p 3714 N93-31196
Building Hadamard matrices in steps of 4 to order 200
[PB93-189835] p 3786 N93-31200
ENDF/B-6 neutron cross section measurement standards
[PB93-189868] p 3818 N93-31201
Temperature-electromotive force reference functions and tables for the letter-designated thermocouple types based on the ITS-90
[PB93-190338] p 3729 N93-31214
NIST scoring package certification procedures in conjunction with NIST special databases 2 and 6
[PB93-188126] p 3838 N93-31331

Optimization of adaptive resonance theory network with boltzmann machine
[PB93-188134] p 3797 N93-31332
Surveillance schemes with applications to mass calibration
[PB93-181881] p 3810 N93-31430
Manual for data administration
[PB93-182053] p 3834 N93-31431
CELIAS: Charge, Element and Isotope Analysis System for the SOHO mission p 3860 N93-31725
Standard Reference Materials: Handbook for SRM users
[PB93-183796] p 3699 N93-31830

NATIONAL LAB. FOR HIGH ENERGY PHYSICS, IBARAKI (JAPAN).
Proceedings of the Workshop on Application of Circularly Polarized X Rays in the Region of 1 to 8 keV
[DE93-704276] p 3823 N93-31165

NATIONAL LAB. FOR HIGH ENERGY PHYSICS, TSUKUBA (JAPAN).
HELAS: HELicity amplitude subroutines for Feynman diagram evaluations
[DE93-715538] p 3813 N93-31166
KDP 903
[DE93-715539] p 3818 N93-31167

NATIONAL MARINE FISHERIES SERVICE, NARRAGANSETT, RI.
Variability of temperature and salinity in the Middle Atlantic Bight and Gulf of Maine
[PB93-174019] p 3769 N93-31591

NATIONAL MATERIALS PROPERTY DATA NETWORK, INC., COLUMBUS, OH.
An intelligent knowledge system for selection of materials for critical aerospace applications (IKSMAT), phase 2
[AD-A263394] p 3835 N93-31078

NATIONAL MEDIA LAB., SAINT PAUL, MN.
National Media Laboratory: Media testing results p 3840 N93-31972

NATIONAL MUSEUM OF NATURAL HISTORY, WASHINGTON, DC.
Field and laboratory investigations of Antarctic meteorites collected by United States expeditions, 1985-1987
[PB93-182723] p 3861 N93-32415

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, CO.
Preliminary evaluation of aviation-impact variables derived from numerical models
[PB93-190197] p 3767 N93-31202
Automatic recognition of solar features p 3880 N93-31421
Heliospheric current sheet effects on the propagation of solar-generated shock waves p 3854 N93-31685
Theory and application of a Radio-Acoustic Sounding System (RASS)
[PB93-191252] p 3769 N93-31815
Investigation of atmospheric aerosols and gases at an east China station
[PB93-184539] p 3752 N93-31831

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, MIAMI, FL.
Hydrographic observations in the western tropical and subtropical North Atlantic Ocean: Atlantic Climate Change Program (ACCP) and Western Tropical Atlantic Experiment (WESTRAX) during 1991
[PB93-184778] p 3770 N93-31832

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, SEATTLE, WA.
Total CO2 and nitrate measurements in the southwest pacific during austral autumn, 1990
[PB93-188415] p 3769 N93-31333
Mean seasonal cycles and interannual variations at 0 deg, 165 deg E during 1986-1992
[PB93-186195] p 3768 N93-31874

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, SILVER SPRING, MD.
Investigation of atmospheric aerosols and gases at an east China station
[PB93-184539] p 3752 N93-31831

NATIONAL PHYSICAL LAB., TEDDINGTON (ENGLAND).
Viscosities of molten slags
[NPL-DMM(A)-55] p 3705 N93-31321
Thermal conductivities of slags
[NPL-DMM(A)-68] p 3705 N93-31322
Surface degradation of polymeric materials
[NPL-DMM(A)-75] p 3709 N93-31323
Electrical conductivities of molten slags
[NPL-DMM(A)-79] p 3705 N93-31324
The NPL reference hazemeter
[NPL-QU-94] p 3729 N93-31325
Characterisation of a protection level Am-241 calibration source
[NPL-RSA(EXT)-35] p 3819 N93-31335
Corrosion-erosion of alloys exposed in fluidised bed combustors
[NPL-DMM(A)-80] p 3705 N93-31602
Diffusion coefficients in molten slags
[NPL-DMM(A)-82] p 3703 N93-31603
VDM specification of the Secure Hash algorithm
[NPL-DITC-212/92] p 3790 N93-31735
Investigation of the electrochemical polarisation behaviour of SiC/6061 Al metal matrix composites
[NPL-DMM(A)-31] p 3700 N93-31736
Evaluation of the chevron notch fracture toughness test for brittle materials
[NPL-DMM(A)-72] p 3742 N93-32384

NATIONAL SCIENCE FOUNDATION, WASHINGTON, DC.
Foreign participation in US Academic science and engineering: 1991
[PB93-186583] p 3833 N93-31328

NATIONAL SOLAR OBSERVATORY, SUNSPOT, NM.
Ground-based coronagraphic observations of solar streamers p 3870 N93-31358
Morphology of coronal loop interactions p 3873 N93-31379

NATIONAL TRANSPORTATION SAFETY BOARD, WASHINGTON, DC.
Aircraft accident report: Takeoff stall in icing conditions. USAir Flight 405, Fokker F-28, N485US, LaGuardia Airport, Flushing, New York, 22 March 1992
[PB93-910402] p 3674 N93-32195
Aircraft accident report: Controlled collision with terrain GP Express Airlines, Inc., Flight 861, a Beechcraft C99, N118GP, Anniston, Alabama, 8 June 1992
[PB93-910403] p 3674 N93-32196

NATIONAL TSING HUA UNIV., HSINCHU (TAIWAN).
Study of the second-order relativistic light deflection of the Sun using long-baseline fibre-linked interferometers: Laser-Interferometric Solar Relativity (LISOR) test p 3849 N93-31778

NATIONAL WEATHER SERVICE, BOHEMIA, NY.
The 3rd national heavy precipitation workshop
[PB93-186625] p 3767 N93-31329

NAVAL AIR WARFARE CENTER, CHINA LAKE, CA.
Piecewise linear neural networks
[AD-A265031] p 3799 N93-32082

NAVAL AIR WARFARE CENTER, PATUXENT RIVER, MD.
Abridged procedural guide to aircrew anthropometric accommodation assessment
[AD-A265220] p 3777 N93-32006

NAVAL CIVIL ENGINEERING LAB., PORT HUENEME, CA.
Chemical dehalogenation treatment: Base-Catalyzed Decomposition Process (BCDP)
[PB93-182939] p 3751 N93-31432

NAVAL COMMAND, CONTROL AND OCEAN SURVEILLANCE CENTER, KAILUA, HI.
TeleOperator/telePresence System (TOPS) Concept Verification Model (CVM) development p 3784 N93-32112

NAVAL COMMAND, CONTROL AND OCEAN SURVEILLANCE CENTER, SAN DIEGO, CA.
Development of jitter measurement procedures for digital fiber optic modules
[AD-A265550] p 3824 N93-31915
Neural attentional sensory processing
[AD-A265163] p 3799 N93-31992
Intelligent security assessment for a mobile robot
[AD-A265003] p 3799 N93-32078
Infinite volume extrapolations of finite cluster calculations. How correct are these?
[AD-A265648] p 3809 N93-32170

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CA.
Advances in dynamical predictions and modelling of tropical cyclone motion
[AD-A264500] p 3767 N93-31195
Trellis coded modulation applied to orthogonal signals
[AD-A265232] p 3717 N93-32060
Petite amateur naval satellite spacecraft digital control system: A hardware design
[AD-A265234] p 3690 N93-32061
A numerical study of seasonal wind forcing effects on the California current system
[AD-A264951] p 3770 N93-32075
Estimating the spatial extent of attractors of iterated function systems
[AD-A265856] p 3809 N93-32315
A parametric analysis of endoatmospheric Low-Earth-Orbit maintenance
[AD-A265868] p 3685 N93-32319
Neural network identification of keystream generators
[AD-A265778] p 3800 N93-32334
Satellite motion around an oblate planet: A perturbation solution for all orbital parameters
[AD-A265779] p 3690 N93-32335

NAVAL RESEARCH LAB., MONTEREY, CA.
Navy tactical applications guide, part 2, volume 8: Arctic-East Siberian/Chukchi/Beaufort Seas. Weather analysis and forecast applications
[AD-A265585] p 3768 N93-31922
Tropical cyclone forecasters reference guide, No. 3: Tropical cyclone formation
[AD-A265216] p 3768 N93-32005

NAVAL RESEARCH LAB., WASHINGTON, DC.
Temperature dependent morphology of untwisted coronal loops p 3875 N93-31393
A comparison of the dynamical signatures of coronal heating mechanisms p 3875 N93-31394
Observational tests of coronal heating models p 3877 N93-31403
Cyclocarbon coalescence: Mechanisms for tailormade fullerene formation
[AD-A265489] p 3821 N93-31995
Optically guided laser wakefield acceleration
[AD-A265441] p 3732 N93-32019
Radiative preheat in strongly coupled, laser accelerated plasmas
[AD-A265442] p 3826 N93-32020
Report of the working group on far field accelerators
[AD-A265443] p 3732 N93-32021
Orbit Analysis Tools Software user's manual, version 1
[AD-A265012] p 3686 N93-32081
Antenna size, transmitter power, and solid state transmitter considerations in affordable radar design
[AD-A264397] p 3718 N93-32414

NAVAL SURFACE WARFARE CENTER, BETHESDA, MD.
Measurement of the out-of-plane shear response of thick section composite materials using the v-notched beam specimen
[AD-A264898] p 3699 N93-31065

NAVAL SURFACE WARFARE CENTER, DAHLGREN, VA.
Tracking filters for precision Electronic Support Measures (ESM) systems
[AD-A264089] p 3719 N93-31085
Deinterleaver technology for future Electronic Support Measures (ESM) systems
[AD-A265005] p 3721 N93-32079

NEW ENERGY AND INDUSTRIAL TECHNOLOGY DEVELOPMENT ORGANIZATION, TOKYO (JAPAN).
Study survey on a high-efficiency environment harmony type energy cascade utilization system
[DE93-768469] p 3748 N93-31812
Eleventh Annual Conference on Energy Conservation and Storage Technologies
[DE93-768429] p 3748 N93-32038
Preliminary study on costs needed for solution of the global environmental problem
[DE93-768474] p 3754 N93-32039
Survey on global environmental effects of petroleum substitution energy utilization
[DE93-768475] p 3754 N93-32040
Session of alcohol and biomass energy technology
[DE93-768440] p 3749 N93-32056
Study on new biomass energy systems
[DE93-768470] p 3749 N93-32057
Feasibility study on introduction of petroleum substituting energy for transportation
[DE93-768472] p 3750 N93-32058

NEW HAMPSHIRE UNIV., DURHAM.
Chemistry and acidity of cloud water at Mount Washington, NH
[PB93-190684] p 3767 N93-31206
CELIAS: Charge, Element and Isotope Analysis System for the SOHO mission p 3860 N93-31725

NEW MEXICO INST. OF MINING AND TECHNOLOGY, SOCORRO.
Preferential flow effects on chemical transport and retardation in soils
[PB93-190668] p 3723 N93-31204
Air quality studies in Albuquerque, New Mexico
[PB93-190817] p 3751 N93-31212

NEW MEXICO STATE UNIV., LAS CRUCES.
High level cognitive information processing in neural networks
[NASA-CR-193296] p 3800 N93-32341

NEW MEXICO UNIV., ALBUQUERQUE.
Chemical transport during formation and alteration of Martian impact and volcanic deposits p 3865 N93-31953
Optoelectronic Materials Center: A collaborative program including University of New Mexico, Stanford University and California Institute of Technology
[AD-A265575] p 3732 N93-32052

NEW ORLEANS UNIV., LA.
Determination of design and operation parameters for upper atmospheric research instrumentation to yield optimum resolution with deconvolution. Appendix 7
[NASA-CR-192836] p 3756 N93-31041

Determination of design and operation parameters for upper atmospheric research instrumentation to yield optimum resolution with deconvolution, appendix 3
[NASA-CR-192835] p 3766 N93-32231

NEW YORK UNIV. MEDICAL CENTER.
Computing with neural maps: Application to perceptual and cognitive function
[AD-A264092] p 3743 N93-31060

NICE UNIV. (FRANCE).
Spectro-imagery with a Rotating Slip-Aperture Telescope (RSAT): Cophasing successive projections in the radon plane p 3849 N93-31779

NIHON UNIV., TOKYO (JAPAN).
Affecting factors to the electrical properties of RuO2 thick-film resistors
[DE93-768332] p 3721 N93-32055

NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIV., GREENSBORO.
Ground Robotic Hand Applications for the Space Program study (GRASP)
[NASA-CR-193571] p 3737 N93-32235

NORTH CAROLINA UNIV., CHAPEL HILL.
Auditory spectro-temporal pattern analysis
[AD-A264691] p 3773 N93-31981
Si/SiO2 interface studies by immersion ellipsometry
[AD-A265151] p 3710 N93-31991
Investigation of trap emission kinetics MOS capacitors using a pump-probe charge integrating technique
[AD-A265198] p 3721 N93-31994
An electron cyclotron resonance plasma process for InP passivation
[AD-A265036] p 3826 N93-31998

NORTHWEST RESEARCH ASSOCIATES, INC., BELLEVUE, WA.
An investigation of methods for improving models of ionospheric plasma-density irregularities and radio-frequency scintillation
[AD-A264156] p 3756 N93-31062

NORTHWESTERN UNIV., EVANSTON, IL.
Probabilistic fracture finite elements
p 3695 N93-31571

NORWEGIAN DEFENCE RESEARCH ESTABLISHMENT, KJELLER.
On the Chebyshev collocation approximation and domain decomposition
[FFI-92/7032] p 3807 N93-31598

NOTRE DAME UNIV., IN.
Quantum transport
[AD-A264935] p 3832 N93-32072

O

OAK RIDGE NATIONAL LAB., TN.
Remote driving with reduced bandwidth communication p 3719 N93-32114
Real-time qualitative reasoning for telerobotic systems
p 3737 N93-32116
Ceramic technology project database
[DE93-012429] p 3710 N93-32161
Fast Fourier Transform analysis of computer-acquired friction data
[DE93-010337] p 3736 N93-32179
International Energy Agency's Heat Pump Centre (IEA-HPC) Annual National Team Working Group Meeting
[DE93-009932] p 3750 N93-32281
Detection of radiation-induced changes in electrochemical properties of austenitic stainless steels using miniaturized specimens and the single-loop electrochemical potentiokinetic reactivation method
[DE93-012865] p 3707 N93-32302
Understanding heat and fluid flow in linear GTA welds
[DE93-012958] p 3727 N93-32303

OAK RIDGE Y-12 PLANT, TN.
The kinetics of the hydriding of uranium metal 2
[DE93-004766] p 3704 N93-31184

OBSERVATOIRE DE LA COTE D'AZUR, NICE (FRANCE).
The need of very accurate optical astrometry by interferometric techniques p 3844 N93-31751

OBSERVATOIRE DE MIDI-PYRESNEES, TOULOUSE (FRANCE).
General properties of the polarization of the Fe 14 5303 A coronal emission line p 3877 N93-31404
Coronagraphic ground based support for SOHO at the Pic-du-Midi Observatory (France) p 3880 N93-31420

OBSERVATOIRE DE PARIS-MEUDON (FRANCE).
Observation of a coronal streamer at meter and decimeter wavelengths p 3872 N93-31373
First ionization potential fractionation
p 3878 N93-31411
Submillimeter interferometry p 3845 N93-31754
Prospects for Earth-based interferometry
p 3845 N93-31755
Atomic and molecular line observations of galaxies
p 3847 N93-31771
Integrated optics for an interferometric link
p 3824 N93-31783
IR single-mode fiber optics for double Fourier interferometry p 3824 N93-31784
Prospects for stellar physics: Structure and influence of circumstellar media p 3850 N93-31789

OBSERVATORIUM FUER SOLARE RADIOASTRONOMIE, TREMSDORF (GERMAN D.R.).
Preliminary observations of solar type 2 bursts with the new radiospectrograph in Tremsdorf (Germany)
p 3872 N93-31370

OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS (FRANCE).
Towards a new approach to autonomous navigation for a vehicle: A link between probability data association filtering and the evidence theory
[ONERA-NT-1990-11] p 3798 N93-31427
Contribution to the experimental and theoretical study of vortex breakdown
[ONERA-NT-1990-12] p 3724 N93-31477
Microstructural studies of ceramic thermal carrier coatings; how it influences coatings thermomechanical resistance
[ONERA-NT-1992-9] p 3709 N93-31597

OFFICE OF TECHNOLOGY ASSESSMENT, WASHINGTON, DC.
Remotely sensed data from space. Distribution, pricing, and applications: An OTA background paper
[PB93-176964] p 3747 N93-32309

OHIO STATE UNIV., COLUMBUS.
Operation of the helicopter antenna radiation prediction code
[NASA-CR-193259] p 3715 N93-31110
Macrofossil records of West Antarctic Ice Sheet retreat during the Holocene p 3759 N93-31881
The diatom record from beneath the West Antarctic Ice Sheet and the global proxy perspective
p 3759 N93-31882
Condition of the Ross Ice Shelf derived from AVHRR imagery p 3760 N93-31886
SPOT satellite mapping of Ice Stream B
p 3760 N93-31887
Mass balance assessment using GPS
p 3761 N93-31892
Surface winds over West Antarctica
p 3763 N93-31903
Feed-forward volume rendering algorithm for moderately parallel MIMD machines
[NASA-CR-191158] p 3792 N93-32322

OLD DOMINION UNIV., NORFOLK, VA.
Design and implementation of fuzzy logic controllers
[NASA-CR-193268] p 3784 N93-31649
Development of a case tool to support decision based software development
[NASA-CR-193289] p 3790 N93-31738
Large angle magnetic suspension test fixture
[NASA-CR-193123] p 3684 N93-31836
Structure and stability of reacting compressible free shear layers
[AD-A265594] p 3727 N93-32095

OPEN UNIV., MILTON (ENGLAND).
Attempts to comprehend Martian surface processes through interpretation of the oxygen isotopic compositions of carbonates in SNC meteorites p 3867 N93-31962

OPTEX, INC., ROCKVILLE, MD.
Electron trapping optical data storage system and applications p 3730 N93-31975

OREGON STATE UNIV., CORVALLIS.
Mixed data/goal driven intelligent real-time assessment and control p 3794 N93-32140

OREGON UNIV., EUGENE.
Calculated mineral precipitation upon evaporation of a model Martian groundwater near 0 C
p 3862 N93-31940
Two jet production in hadron collisions at order alpha(sub s)(sup 3) in QCD
[DE93-010563] p 3822 N93-32159

ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK, DELFT (NETHERLANDS).
An automated processing system for food frequency and nutrition knowledge questionnaire p 3778 N93-32241

ORSTED INST., COPENHAGEN (DENMARK).
The modern research environment
p 3837 N93-31221

OSAKA UNIV., IBARAKI (JAPAN).
Proceedings of the Workshop on Spin-Charge Transfer Reaction in Atomic Collision Process for planning of next period of cascade project
[DE93-704290] p 3821 N93-31834

OSLO UNIV. (NORWAY).
CDS and SUMER observations of fine structure and dynamics of loops: Experience from HRTS
p 3873 N93-31376
Multiple flows in the solar transition region
p 3857 N93-31704
Portable equipment developed to estimate energy expenditure by simultaneous recording of heart rate and body position p 3778 N93-32243

OULU UNIV. (FINLAND).
Ionospheric control of the long-term occurrence of Pc1 pulsations observed on ground p 3860 N93-31722

OXFORD UNIV. (ENGLAND).
A design for a visual motion transducer
[OUEL-1960/92] p 3785 N93-31054
A framework for spatio-temporal control in the tracking of visual contours
[OUEL-1961/92] p 3785 N93-31055
An experimental study of under-expanded jets
[OUEL-1959/92] p 3722 N93-31124
Evaluation of a solid-state gyroscope for robotics applications
[OUEL-1957/92] p 3728 N93-31125
A theory of planar grasp
[OUEL-1958/92] p 3785 N93-31126
Analysis of the compliant motion achievable with an industrial robot: Identification, feedback and design
[OUEL-1899/91] p 3733 N93-31150
Extracting projective information from single views of 3D point sets
[OUEL-1927/92] p 3785 N93-31151
An efficient constrained predictive control algorithm for 2-input systems
[OUEL-1946/92] p 3785 N93-31152
Characterisation and control of a flexible robot subject to torque ripple
[OUEL-1952/92] p 3734 N93-31156

P

PACIFIC NORTHWEST LAB., RICHLAND, WA.
Effects of surface defects on the local electric field in inhomogeneous media
[DE93-011035] p 3830 N93-32182
Excitation rate and background measurements during LiF studies on krypton
[DE93-013500] p 3732 N93-32304

PARIS XI UNIV., ORSAY (FRANCE).
SOHO overview and preparation for operations
p 3867 N93-31344
Quiet and active solar structures as observed at the bottom of the transition region p 3874 N93-31382
Radiative modeling of solar prominences, two-dimensional transfer plus partial frequency redistribution p 3875 N93-31389

PEKING UNIV. (CHINA).
What can we learn from the shape of loops?
p 3874 N93-31386

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Computer simulation of 3D material microstructure and its application in the determination of mechanical behavior of polycrystalline materials and engineering structures
p 3708 N93-31134
Thermal shock and fatigue behavior of ceramic tubes
p 3739 N93-31139
Penn State axial flow turbine facility: Performance and nozzle flow field p 3698 N93-31588
Projects within the Center for Advanced Materials
[PB93-175222] p 3699 N93-31870
In search of ice-stream sticky spots
p 3762 N93-31899
Geologic controls on the West Antarctic Ice Sheet
p 3762 N93-31900
Characterization of small noble metal electrodes by voltammetry and energy dispersive x ray analysis
[AD-A265208] p 3721 N93-32001
An incompressible axisymmetric through-flow calculation procedure for design and off-design analysis of turbomachinery
[AD-A264933] p 3726 N93-32071

PENNSYLVANIA UNIV., PHILADELPHIA.
Modeling and inference for transient tracers on oceanic flow
[AD-A265428] p 3770 N93-32037

PHILLIPS LAB., EDWARDS AFB, CA.
Application of the SAHA equation to high temperature (greater than or equal to 6000 K) rocket exhaust
[AD-A264004] p 3692 N93-31291

PHILLIPS LAB., KIRTLAND AFB, NM.
Exploring the limits of adaptive wavefront compensation for ground based astronomical interferometers
p 3849 N93-31782

PHYSIKALISCH-TECHNISCHE BUNDESANSTALT, BERLIN (GERMANY).
CELIAS: Charge, Element and Isotope Analysis System for the SOHO mission p 3860 N93-31725

PITTSBURGH UNIV., PA.
Organization of the human circadian system
[AD-A264675] p 3774 N93-32015

POLISH ACADEMY OF SCIENCES, WARSAW.
Steady states in the twin-well potential oscillator: Computer simulations and approximate analytical studies
[REPT-40/1992] p 3722 N93-32214
Some aspects of invariant theory in plasticity. Part 2: Constitutive relations for perfectly locking materials. Comments on perfectly plastic solids
p 3742 N93-32321

POLISH ACADEMY OF SCIENCES, WROCLAW.
Objectives of RESIK solar concave soft x ray spectrometer for Coronas-F mission
p 3879 N93-31418

POLITECNICO DI MILANO (ITALY).
Spatial relational algebra: An extended relational algebra for spatial database
[REPT-92-051] p 3786 N93-31249
ALGODESK: An experimental comparison of eight evolutionary heuristics applied to the QAP problem
[REPT-92-052] p 3786 N93-31250
Timing analysis of real-time systems
[REPT-92-060] p 3803 N93-31251
Assuring type safety of object-oriented languages
[REPT-92-061] p 3787 N93-31252
Pulse discriminator for crosstalk rejection in a multi-channel isochromat photoemission spectroscopy
[REPT-92-062] p 3719 N93-31253
Testability of artificial neural networks: A behavioral approach
[REPT-92-047] p 3797 N93-31254
Analysis of fault tolerance in artificial neural networks
[REPT-92-048] p 3797 N93-31255
RLS techniques with generalized forgetting devices for the identification of time-varying systems
[REPT-92-069] p 3810 N93-31463
Managing semantic heterogeneity with production rules and persistent queues
[REPT-92-078] p 3811 N93-31464
Modeling industrial distributed control systems with Petri nets
[REPT-92-079] p 3714 N93-31465
Deriving incremental production rules for deductive data
[REPT-92-081] p 3787 N93-31466
Modeling users' behavior and threats for security
[REPT-92-071] p 3811 N93-31476
A proposal on the quality of the binary thresholds of a contour detection
[REPT-91-075] p 3806 N93-31544
Quality support tool of simulation models: A comparison between methodology
[REPT-92-061/BIS] p 3839 N93-31605
The shot continuation operator
[REPT-92-065] p 3758 N93-31606
Determination of the electrostatic Green's function for stratified media
[REPT-92-067] p 3716 N93-31607
Numerical analysis of the spectral domain of transmission lines in dielectric layers
[REPT-92-068] p 3716 N93-31608
Characteristics and properties of the continuity equations in a semiconductor
[REPT-92-080] p 3720 N93-31609
Ant system for job-shop scheduling
[REPT-92-066] p 3792 N93-32346
Is time a real time? An overview of time ontology in informatics
[REPT-92-046] p 3842 N93-32383
Knowledge based document retrieval in office environments: The Kabiria system
[REPT-92-032] p 3843 N93-32389
Adaptive RLS identification with generalized forgetting techniques
[REPT-92-037] p 3810 N93-32390
Introduction to natural algorithms
[REPT-92-058] p 3793 N93-32391

PORTUGUESE AIR FORCE, ALFRAGIDE.
Nutritional and lifestyle status of 50 pilots of the Portugese Air Force p 3780 N93-32255

PRATT AND WHITNEY AIRCRAFT, WEST PALM BEACH, FL.
Fatigue in single crystal nickel superalloys
[AD-A265451] p 3706 N93-31795

PRC ENVIRONMENTAL MANAGEMENT, INC., MCLEAN, VA.
Applications analysis report: Silicate Technology Corporation's solidification/stabilization technology for organic and inorganic contaminants in soils
[PB93-172948] p 3715 N93-32408

PRINCETON UNIV., NJ.
Modeling studies of ice-ocean dynamics and thermodynamics
[AD-A264084] p 3769 N93-31082
Pressure induced topological phase transitions in membranes
[AD-A265212] p 3829 N93-32002

R

RADIOPHYSICS, INC., BOULDER, CO.
User friendly database for Neptune planetary radio astronomy observations
[NASA-CR-193261] p 3851 N93-32324

RAUMA-REPOLA OY, TAMPERE (FINLAND).
Applying MORT maintenance safety analysis in Finnish industry
[VTT-TIED-1332] p 3714 N93-31545

RENSSELAER POLYTECHNIC INST., TROY, NY.
A comparison of force control algorithms for robots in contact with flexible environments
[NASA-CR-193251] p 3789 N93-31638
Performance analysis of a robotic system for space-based assembly p 3801 N93-32101

RESEARCH TRIANGLE INST., RESEARCH TRIANGLE PARK, NC.
Advanced launch system multi-path redundant avionics architecture analysis and characterization
[NASA-CR-4516] p 3795 N93-31642

RICE UNIV., HOUSTON, TX.
Reconstruction of late Wisconsinan Ice Sheet and sea-level implications p 3758 N93-31879
Infrared spectroscopy of hydrogen and water on diamond (100)
[AD-A265531] p 3704 N93-31920
Investigation of diamond homoepitaxy by in situ Fizeau interferometry: The role of oxygen
[AD-A265544] p 3829 N93-31921
Progress toward atomic layer epitaxy of diamond using radical chemistry
[AD-A265409] p 3829 N93-32045

ROCHESTER UNIV., NY.
Beyond data parallelism: The advantages of multiple parallelizations in combinatorial search
[AD-A265008] p 3796 N93-32080
Combining qualitative and quantitative spatial and temporal information in a hierarchical structure: Approximate reasoning for plan execution monitoring
p 3835 N93-32132

ROCKWELL INTERNATIONAL CORP., CANOGA PARK, CA.
Probabilistic load simulation: Code development status
p 3694 N93-31564
Probabilistic evaluation of SSME structural components p 3694 N93-31565
Rocketdyne PSAM: In-house enhancement/application p 3694 N93-31566
Expert system development for probabilistic load simulation p 3695 N93-31570
Constitutive and damage material modeling in a high pressure hydrogen environment p 3696 N93-31577
Examination of the effect of propulsion system performance variables on the life prediction for the SSME Lox Post p 3697 N93-31580

ROME LAB., GRIFFISS AFB, NY.
Initial definition of a Knowledge-Based Software Quality Assistant
[AD-A265866] p 3793 N93-32418

ROTORDYNAMICS-SEAL RESEARCH, INC., SIMI VALLEY, CA.
Design review of fluid film bearing testers
[NASA-CR-193299] p 3735 N93-31731

ROYAL AEROSPACE ESTABLISHMENT, FARNBOROUGH (ENGLAND).
Heat transfer measurements using infra-red thermography in rarefied flows
[RAE-TM-W-1] p 3724 N93-31336
Thermal stability of lithiated vanadium oxide (LVO), gamma-lithium vanadium bronze (gamma-LiV2O5) and vanadium dioxide (VO2) thermal battery cathode materials
[RAE-TR-92047] p 3722 N93-32422

ROYAL AIR FORCE CENTRAL MEDICAL ESTABLISHMENT, LONDON (ENGLAND).
Blood lipids in aircrew recruits and in RAF aviators
p 3774 N93-32251

ROYAL INST. OF TECH., STOCKHOLM (SWEDEN).
Multicomponent double layers
[TRITA-ALP-92-03] p 3825 N93-31542
One-dimensional numerical simulations of the low-frequency electric fields in the CRIT1 and CRIT2 rocket experiments
[TRITA-ALP-1992-01] p 3758 N93-31625
The dynamics and stability of weak double layers
[TRITA-ALP-92-02] p 3825 N93-31626
Viking observations of electric fields
p 3858 N93-31712
Investigation of fine-scale aurora with the Freja electric field instrument p 3860 N93-31719

ROYAL NETHERLANDS METEOROLOGICAL INST., DE BILT.
The parameterization of vertical turbulent mixing processes in a general circulation model of the tropical Pacific
[KNMI-WR-92-03] p 3758 N93-31594
A scintillation experiment over a forest
[KNMI-WR-92-04] p 3746 N93-31595
List of acronyms in environmental sciences
[KNMI-PUBL-180-ED-1] p 3838 N93-31596
Experimental evaluation of an arrival time difference lightning positioning system
[KNMI-WR-92-01] p 3767 N93-31600
GCM control run of UK Meteorological Office compared with the real climate in the NW European winter
[KNMI-WR-92-02] p 3767 N93-31601

ROYAL NORWEGIAN AIR FORCE, OSLO.
Changes in some lifestyle parametres in Norwegian pilots as students, and after 6 and 12 years of service
p 3781 N93-32261

ROYAL SIGNALS AND RADAR ESTABLISHMENT, MALVERN (ENGLAND).
Z through pictures
[RSRE-MEMO-4587] p 3787 N93-31337
A segmental hidden Markov model for speech pattern processing
[RSRE-MEMO-4599] p 3716 N93-31610
Code vector density in topographic mappings
[RSRE-MEMO-4669] p 3746 N93-31611
Comparative aspects of Earth- and space-based interferometry p 3845 N93-31756
High resolution imaging from the ground using a satellite-borne laser guide star p 3849 N93-31781

RUHR UNIV., BOCHUM (GERMANY).
The International Stratospheric Laboratory for Astrophysics (ISLA): The cosmic microscope
p 3846 N93-31765

RUTHERFORD APPLETON LAB., CHILTON (ENGLAND).
The coronal diagnostic spectrometer for the Solar and Heliospheric Observatory p 3868 N93-31347
The SOHO interdisciplinary science matrix
p 3880 N93-31426

RUTHERFORD HIGH ENERGY LAB., CHILTON (ENGLAND).
Exploring the magnetospheric boundary layer
p 3855 N93-31694
Detecting and tracking changes in solar wind conditions using interplanetary scintillation p 3857 N93-31703
Solar wind penetration to geostationary altitude during the March 1991 magnetic storm p 3857 N93-31706
Co-ordinated data handling for the UK participants in the Cluster mission p 3843 N93-31713
Distributed data systems in space physics
p 3859 N93-31715
Coronal mass ejecta and flares: A statistical study
p 3859 N93-31716

S

SAINT ANDREW'S UNIV. (SCOTLAND).
Thermal profiles of coronal loops: Gravitational considerations p 3873 N93-31381
The magnetothermal stability of radially stratified line-tied coronal loops p 3876 N93-31400
Fast computation of magnetohydrostatic equilibria using Euler potentials and multigrid methods
p 3877 N93-31401
Solar coronal magnetic structure
p 3852 N93-31676
Magnetic field reconnection at the dayside magnetopause p 3855 N93-31696

SAINT OLAF COLL., NORTHFIELD, MN.
Radar studies of the West Antarctic ice streams
p 3760 N93-31891

SAMTECH S.A., LIEGE (BELGIUM).
Vibration analysis in turbomachines
p 3683 N93-32274

SAN FRANCISCO STATE UNIV., CA.
Reflectance spectroscopy and GEX simulation of palagonite and iron-rich montmorillonite clay mixtures: Implications for the surface composition of Mars
p 3865 N93-31954

SANDIA NATIONAL LABS., ALBUQUERQUE, NM.
F2D: A two-dimensional compressible gas flow code
[DE93-003239] p 3723 N93-31169
The performance of PAGOSA on several MIMD parallel computers
[DE93-003243] p 3786 N93-31183
Welding and metallurgy
[DE93-010926] p 3735 N93-31790
The technology base for agile manufacturing
p 3715 N93-32104
RATLER: Robotic All-Terrain Lunar Exploration Rover
p 3737 N93-32117

Surface-emitting laser-based optical switching: An update
[DE93-010689] p 3732 N93-32180
Si atomic layer epitaxy based on Si2H6 and remote He plasma bombardment
[DE93-011674] p 3830 N93-32183
A neural network approach to seismic phase identification
[DE93-013601] p 3800 N93-32305
Micromachined chemical sensor with integrated microelectronics
[DE93-013761] p 3730 N93-32306
Measurements and analysis of the equivalent circuit of the GEC RF Reference Cell
[DE93-013498] p 3718 N93-32425

SANDIA NATIONAL LABS., LIVERMORE, CA.
Dynamic response of a transducer mounted at one end of an acoustical cavity
[DE93-012837] p 3816 N93-32301

SCIENCE APPLICATIONS INTERNATIONAL CORP., MCLEAN, VA.
Evolution and oscillations of coronal loops
p 3876 N93-31395

SCIENCE APPLICATIONS INTERNATIONAL CORP., VIENNA, VA.
EHF military communication satellite alternatives study
[SS/L-TR00775] p 3716 N93-31311

SCIENTIFIC RESEARCH ASSOCIATES, INC., GLASTONBURY, CT.
Numerical studies of low temperature gallium arsenide buffer layers and their influence on device operation
[AD-A264296] p 3829 N93-32083

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CA.
Implications of isotopic compositions of N and Ne in the Martian atmosphere to temporal evolution of its atmosphere and regolith p 3864 N93-31947
Upgrade of the LIMDAS day/night whole sky imager
[AD-A265871] p 3769 N93-32171
Near bottom data collection and data analysis
[AD-A265872] p 3771 N93-32172
Research platforms FLIP and ORB support
[AD-A265910] p 3771 N93-32320

SECA, INC., HUNTSVILLE, AL.
Radiation/convection coupling in rocket motor and plume analysis
[NASA-CR-193288] p 3698 N93-31845

SERVICE DE MEDECINE AERONAUTIQUE, VERSAILLES (FRANCE).
Lipodystrophies in the French military flight crew
p 3774 N93-32249

SHEFFIELD UNIV. (ENGLAND).
The implementation of the digital wave processor for the ESA/NASA Cluster mission p 3858 N93-31708
An investigation of dayside FTE's observed by the AMPTE-UKS satellite p 3858 N93-31709
Role of the INTERBALL small scale investigations in the GGS program p 3859 N93-31717

SIEMENS A.G., MUNICH (GERMANY).
Automating multilingual communication
p 3837 N93-31219

SLOVAK ACADEMY OF SCIENCES, TATRANSKA LOMNICA (CZECHOSLOVAKIA).
The solar corona structures as inferred from July 11, 1991 total solar eclipse observation
p 3872 N93-31372

SMALL BUSINESS ADMINISTRATION, WASHINGTON, DC.
States and small business: A directory of programs and activities, 1993 edition
[PB93-186427] p 3834 N93-31433

SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MA.
Space-based astrometric optical interferometry with POINTS p 3845 N93-31758
Development of high resolution imaging detectors for x ray astronomy
[NASA-CR-193653] p 3851 N93-32363

SMITHSONIAN INSTITUTION, CAMBRIDGE, MA.
The application of two-dimensional imaging to very high energy gamma ray astronomy
[DE93-012326] p 3851 N93-32160

SOFTWARE PRODUCTIVITY SOLUTIONS, INC., INDIALANTIC, FL.
System engineering concept demonstration, security study, volume 7
[AD-A265473] p 3791 N93-32007
System engineering concept demonstration, effort summary, volume 1
[AD-A265467] p 3791 N93-32022
System engineering concept demonstration, system engineering needs, volume 2
[AD-A265468] p 3791 N93-32023
System engineering concept demonstration, interface standards studies, volume 4
[AD-A265470] p 3791 N93-32024

SOLAR PHYSICS RESEARCH CORP., TUCSON, AZ.
Observations of the quiet Sun from the soft x ray telescope on Yohkoh p 3874 N93-31388

SOUTHWEST RESEARCH INST., SAN ANTONIO, TX.
Long-term reliability of gas pipeline repairs by reinforced composites. Annual report, July 1991-June 1992
[PB93-188647] p 3700 N93-31334
Structural reliability methods: Code development status p 3694 N93-31563
Commercialization of NESSUS: Status
p 3695 N93-31567
Probabilistic structural analysis algorithm development for computational efficiency p 3695 N93-31569
Coronal shock waves p 3853 N93-31681
Auroral Cluster: Science objectives and measurement strategies p 3858 N93-31710
Diagnostics of magnetic substorms using satellite observations of magnetic pulsations
[AD-A264300] p 3764 N93-32084

SPACE SYSTEMS/LORAL, PALO ALTO, CA.
EHF military communication satellite alternatives study
[SS/L-TR00775] p 3716 N93-31311

SPACE TECHNOLOGY IRELAND LTD., MAYNOOTH.
Energetic particles (greater than 34 KeV - 3.2 MeV) in the deep Martian magnetotail (X = 15.5 R(sub M)), modeling of the Martian bow shock and the influence of low solar wind pressure on Mars as an obstacle
p 3855 N93-31691

SPACE TELESCOPE SCIENCE INST., BALTIMORE, MD.
SISTERS: A space interferometer for the search for terrestrial exo-planets by rotation shearing
p 3846 N93-31764
HARDI: A High Angular Resolution Deployable Interferometer p 3850 N93-31786

SPANISH AIR FORCE, TALAVERA AFB.
Trial of emergency ration of the Spanish Air Force
p 3778 N93-32247
Objective improvements obtained by control of diet and physical training in Spanish Air Force fighter pilots
p 3780 N93-32258

SPAUSCHUS ASSOCIATES, INC., ATLANTA, GA.
Chemical and thermal stability of refrigerant-lubricant mixtures with metals
[DE93-013082] p 3715 N93-32163
Solubility, viscosity and density of refrigerant/lubricant mixtures
[DE93-014771] p 3711 N93-32293

SPIRE CORP., BEDFORD, MA.
Multi-quantum well lateral-field-effect electro-refraction modulator
[AD-A264411] p 3729 N93-31191

SRI INTERNATIONAL CORP., MENLO PARK, CA.
Novel strategies for the synthesis of methane adsorbents with controlled porosity and high surface area
[PB93-189967] p 3702 N93-31209
Optical and kinetic processes in excimer lasers
[AD-A264210] p 3733 N93-32402

STANFORD RESEARCH INST., MENLO PARK, CA.
Novel spin effects in quantum chromodynamics
[DE93-010955] p 3833 N93-32181

STANFORD UNIV., CA.
Experiments in the control of wing rock at high angle of attack using tangential leading edge blowing
p 3683 N93-31068
Low voltage electron beam lithography
[AD-A263360] p 3719 N93-31080
Contact mechanics and the dynamics of manipulation
p 3733 N93-31103
The solar oscillations investigation: Michelson Doppler imager p 3867 N93-31345
A magnetostatic coronal model with horizontal electric currents: Modeling the coronal streamer belt
p 3871 N93-31366
Static and dynamic loop models and their observational signatures p 3873 N93-31377
Observations of the quiet Sun from the soft x ray telescope on Yohkoh p 3874 N93-31388
Research studies in electromagnetically induced transparency
[AD-A264303] p 3732 N93-31866
Infrared multiple photon dissociation spectra of gaseous ions
[AD-A264378] p 3821 N93-32032
Stanford Aerospace Research Laboratory research overview p 3690 N93-32103
Agent oriented programming: An overview of the framework and summary of recent research
p 3794 N93-32136
Strategic control of reactive behavior in intelligent agents
[AD-A264376] p 3801 N93-32413

STATE UNIV. OF NEW YORK, BUFFALO.
Time accurate simulations of compressible shear flows
[NASA-CR-193410] p 3728 N93-32371

STERLING FEDERAL SYSTEMS, INC., MOFFETT FIELD, CA.
NASA/ARC proposed training in intelligent control
p 3688 N93-31444

STERNBERG ASTRONOMICAL INST., MOSCOW (USSR).
On the Fabry-Perot investigations of the solar corona: Eclipse observations of the green line intensities and half widths p 3872 N93-31375

STERRENWACHT SONNENBORGH, UTRECHT (NETHERLANDS).
UV interferometry of hot stars p 3848 N93-31774
High resolution solar physics p 3848 N93-31775

STEVENS INST. OF TECH., HOBOKEN, NJ.
Three-dimensional modeling of pollutant transport in surface waters
[PB93-190627] p 3751 N93-31203
Investigation of transitions from order to chaos in dynamical systems
[DE93-014437] p 3833 N93-32290

STORAGE TECHNOLOGY CORP., LOUISVILLE, CO.
The standards process: Technical committee X3B5 digital magnetic tape p 3840 N93-31967
The redwood project: An overview
p 3841 N93-31979

SUPERCOMPUTER RESEARCH CENTER, BOWIE, MD.
Measurements over distributed high performance computing and storage systems p 3841 N93-31977

SUSSEX UNIV., BRIGHTON (ENGLAND).
Reconnection in the solar corona
p 3855 N93-31695

SVERDRUP TECHNOLOGY, INC., HUNTSVILLE, AL.
Microbiological test results of the environmental control and life support systems vapors compression distillation subsystem recycle tank components following various pretreatment protocols
[NASA-CR-192570] p 3772 N93-32354
Microbiological and corrosion analysis of three urine pretreatment regimes with titanium 6A1-4V
[NASA-CR-192575] p 3783 N93-32356
Optimization of 15 parameters influencing the long-term survival of bacteria in aquatic systems
[NASA-CR-192571] p 3772 N93-32365

SWEDISH INST. OF SPACE PHYSICS, KIRUNA.
Meteor impacts, sporadic E layer formation and the incoherent scatter method
[IRF-SF-210] p 3852 N93-31624

SWEDISH INST. OF SPACE PHYSICS, UPPSALA.
Plasma waves interferometry on Cluster
p 3827 N93-31714

SWISSAIR, ZURICH (SWITZERLAND).
The ecological balance of Swissair: An example of waste management p 3753 N93-31930

SYDNEY UNIV. (AUSTRALIA).
Buckling and postbuckling of stiffened thin skinned carbon fibre composite panels
[ATN-9301] p 3742 N93-32331

T

TECHNICAL RESEARCH CENTRE OF FINLAND, ESPOO.
Calibration system for testing laboratory
[VTT-TIED-1401] p 3738 N93-31172
Publication catalogue of VTT in 1991
[VTT-TIED-1340] p 3838 N93-31535
Transient analysis for ground fault distance estimation in electrical distribution networks
[VTT-PUBS-115] p 3720 N93-31536
Applying MORT maintenance safety analysis in Finnish industry
[VTT-TIED-1332] p 3714 N93-31545
Biological treatment of porous off-gases
[VTT-JULK-766] p 3752 N93-31853
New alternative for electricity production. Part 3: Electricity production from biomass and natural gas by a solid oxide fuel cell
[VTT-TIED-1397] p 3720 N93-31862
On the quantitative interpretation of uranium series disequilibria
[VTT-TIED-1404] p 3821 N93-31863
Acoustic logging for structural and hydrogeological bedrock investigations
[VTT-JULK-762] p 3816 N93-31865
Performance of an impact loaded sandwich plate
[VTT-JULK-767] p 3702 N93-32388
Surface roughness measuring systems
[VTT-TIED-1392] p 3748 N93-32420
Modeling of optical waveguide biosensor structures
[VTT-PUBS-112] p 3824 N93-32421

TECHNICAL UNIV. OF DENMARK, LYNGBY.
Low-temperature formation of magnetic iron oxides
p 3863 N93-31946

TECHNICAL UNIV. OF NORWAY, TRONDHEIM.
End users: New products and services
p 3837 N93-31220
TECHNISCHE UNIV., BERLIN (GERMANY).
System study of tether technology with particular consideration of transport utilization possibilities in space transportation
[ILR-MITT-270(1992)] p 3685 N93-31207
TECHNISCHE UNIV., BRUNSWICK (GERMANY).
Development of technical processes for manufacturing heavy metal fluoride glass fibers
[ETN-93-94200] p 3707 N93-31047
Deformation analysis of welded joints
[ETN-93-94199] p 3739 N93-31057
TECHNISCHE UNIV., DELFT (NETHERLANDS).
Duality and sensitivity in quadratic optimization over a sphere
[REPT-92-65] p 3804 N93-31470
A generalized asymptoticity problem in max algebra, the general case
[REPT-92-76] p 3804 N93-31471
DIAC at TWI
[REPT-92-77] p 3787 N93-31472
Evaluating master-slave implementation of double-dot parsing for massive parallel MIMD systems
[REPT-92-78] p 3794 N93-31473
An extended algorithm for performance evaluation of timed event graphs
[REPT-92-75] p 3787 N93-31474
The linear quadratic digital control of infinite-dimensional systems with unbounded input and output operators
[REPT-92-49] p 3798 N93-31483
Termination criteria for GMRES-like methods to solve the discretized incompressible Navier-Stokes equations
[REPT-92-50] p 3724 N93-31484
On a class of geometric vector optimization problems
[REPT-92-51] p 3804 N93-31485
Processor-management in distributed systems with a compute-intensive workload
[REPT-92-52] p 3787 N93-31486
Disturbance decoupling by measurement feedback for structured systems: A graph theoretical approach
[REPT-92-53] p 3805 N93-31487
Finite volume methods constructed by mixed variational formulation. Part 2: Error estimates in discrete energetic norms
[REPT-92-86] p 3805 N93-31488
Finite volume methods constructed by mixed variational formulation. Part 1: Description of the discretization technique
[REPT-92-85] p 3805 N93-31489
An operator method to study some resonance boundary value problems in elasticity theory
[REPT-92-84] p 3740 N93-31490
Efficient estimation of the mean for interval censoring, case 2
[REPT-92-83] p 3811 N93-31491
The generic dimension of a minimal realization of an AR-system
[REPT-92-82] p 3805 N93-31492
Practical results on parallel parsing
[REPT-92-79] p 3794 N93-31493
Fluid flow visualization
[REPT-92-69] p 3724 N93-31494
Hybrid rendering of scientific data using an h-buffer
[REPT-92-68] p 3788 N93-31495
Benchmark solutions for the incompressible Navier-Stokes equations in general coordinates on staggered grids
[REPT-92-67] p 3724 N93-31496
Tidally averaged models for dispersion in shallow water
[REPT-92-66] p 3769 N93-31497
Recent developments in database management
[REPT-92-61] p 3838 N93-31498
The mechanization of lambda calculus
[REPT-92-60] p 3805 N93-31499
A single recursion operator is sufficient
[REPT-92-59] p 3805 N93-31500
Structurally stable quadratic systems without limit cycles
[REPT-92-58] p 3805 N93-31501
Isocliny, Souillart matrices, quaternions and four-dimensional rotations
[REPT-92-57] p 3813 N93-31502
Regularity of stochastic processes: A theory based on directional convexity
[REPT-92-70] p 3811 N93-31503
Generalized steady-state, applied to 2-D, 3-D massively parallel computing
[REPT-92-71] p 3795 N93-31504
Uniqueness of limit cycles in polynomial systems with algebraic invariants
[REPT-92-72] p 3805 N93-31505
Implementations of the double dot parsing algorithm
[REPT-92-73] p 3788 N93-31506
An annotated bibliography of inductive learning since 1985
[REPT-92-74] p 3833 N93-31507
The development of a ring model for the study of tire in-plane dynamics
[MEMT-20] p 3734 N93-31508
Most monothetic extensions are rank-1
[REPT-93-05] p 3813 N93-31546
Numerical study of a multigrid method with four smoothing methods for the incompressible Navier-Stokes equations in general coordinates
[REPT-93-04] p 3725 N93-31547
Performance of scanline-oriented CSG direct display algorithms
[REPT-93-03] p 3788 N93-31548
Sobolev-type orthogonal polynomials with a small number of real zeros
[REPT-92-64] p 3806 N93-31549
Existence and uniqueness of limit cycles for a special system of differential equations on the plane
[REPT-92-63] p 3806 N93-31550
The crease structure of the Karush-Kuhn-Tucker set in parametric optimization
[REPT-92-62] p 3806 N93-31551
Geometrical aspects of quaternions and complex numbers
[REPT-92-56] p 3807 N93-31612
Perturbation of the Laplacian by the Coulomb potential and a point interaction in L(sup p)(R cubed)
[REPT-92-55] p 3807 N93-31613
Graph theoretic methods for the computation of disturbance decoupling feedback matrices for structured systems
[REPT-92-54] p 3789 N93-31614
Tapes, queues and communicating automata in DIAC
[REPT-92-94] p 3789 N93-31631
Fractal image coding techniques and contraction operators
[REPT-92-93] p 3789 N93-31632
Resonance and near-resonance for a nonlinear wave equation
[REPT-92-92] p 3814 N93-31633
An ILU smoother for the incompressible Navier-Stokes equations in general coordinates
[REPT-92-91] p 3725 N93-31634
Generic modal resolution
[REPT-92-90] p 3807 N93-31635
On the dynamics of aeroelastic oscillators with one degree of freedom
[REPT-92-96] p 3815 N93-31653
Point interactions on bounded domains
[REPT-92-97] p 3807 N93-31654
Estimation of density functionals
[REPT-92-98] p 3807 N93-31655
Fractal coding of monochrome images
[REPT-92-99] p 3790 N93-31656
Multigrid schemes for time-dependent incompressible Navier-Stokes equations
[REPT-92-102] p 3725 N93-31657
Galerkin coarse grid approximation in multigrid for the incompressible Navier-Stokes equations
[REPT-92-103] p 3726 N93-31658
Primal-dual algorithms for linear programming based on the logarithmic barrier method
[REPT-92-104] p 3790 N93-31659
The Delfi3 debugger: Notes on the implementation
[REPT-92-106] p 3790 N93-31850
The optimal projection equations for digital control of infinite-dimensional systems
[REPT-93-01] p 3799 N93-31851
Revision by expansion in logic programs
[REPT-93-02] p 3790 N93-31852
Decay-usage scheduling in multiprocessor and distributed systems. 1: Theory
[REPT-92-105] p 3795 N93-31864
Some historical notes about the Stefan problem
[REPT-93-07] p 3728 N93-32397
The reuse of large-scale components
[REPT-92-95] p 3793 N93-32419
TECHNISCHE UNIV., EINDHOVEN (NETHERLANDS).
Job shop scheduling by local search
[MEMO-COSOR-92-29] p 3834 N93-31510
Coordination of production and sales
[ETN-93-94039] p 3834 N93-31518
On the verification of a theory for sculling propulsion
[ETN-93-94040] p 3725 N93-31519
Liquid-crystalline main-chain polymers with flexible side chains: Synthesis, structure, processing and properties of poly(p-phenylene terephthalate)s with alkoxy side chains
[ETN-93-94041] p 3709 N93-31520
Kinetics of adsorption from liquid phase on activated carbon
[ETN-93-94042] p 3703 N93-31521
Periodic multiprocessor scheduling
[ETN-93-94043] p 3795 N93-31522
Scattering of electrons at heterostructure interfaces
[ETN-93-94044] p 3828 N93-31523
The microwave radiometer as a remote sensing device: Design and application
[ISBN-9-09-005507-X] p 3746 N93-31537
Near miss reporting in the chemical process industry
[ISBN-9-03-860181-6] p 3714 N93-31539
Web crippling of cold-formed steel members
[ISBN-9-03-860122-0] p 3705 N93-31540
Zirconia ceramics and mechanical surface interactions
[ETN-93-94049] p 3709 N93-31541
Man, technology, society and development: From the hunters and gatherers to the first industrial revolution 3.5 million years ago into AD1760
[ISBN-9-03-860102-6] p 3833 N93-31543
Selection by simulation: A work sample approach to the selection of process algebras
[ISBN-9-09-005483-9] p 3811 N93-31618
Light-induced band-structure modifications in modulation-doped 3-5 semiconductor heterostructures
[ETN-93-94053] p 3828 N93-31619
Carrier capture in 3-5 semiconductor quantum wells
[ETN-93-94054] p 3828 N93-31620
Coulomb-blockade oscillations in quantum dots and wires
[ETN-93-94055] p 3831 N93-31621
Interactions between tetraalkylammonium ions and silicates
[ETN-93-94057] p 3703 N93-31622
Isotopically selective detection of rubidium in krypton
[ETN-93-94051] p 3703 N93-31630
TEL-AVIV UNIV. (ISRAEL).
The Israel Space Agency 1993 p 3883 N93-31590
TENNESSEE TECHNOLOGICAL UNIV., COOKEVILLE.
Design of coupled mace filters for optical pattern recognition using practical spatial light modulators
[NASA-CR-193192] p 3823 N93-31841
TENNESSEE UNIV., KNOXVILLE.
Statistical and numerical methods in control and identification
[AD-A264676] p 3811 N93-32016
A mechanics model for the compressive response of fiber reinforced composites
[AD-A265556] p 3701 N93-32067
TEXAS A&M UNIV., COLLEGE STATION.
Melatonin, the pineal gland, and circadian rhythms
[AD-A264099] p 3772 N93-31061
New directions for the catalytic conversion of methane
[PB93-188795] p 3702 N93-31435
TEXAS UNIV., AUSTIN.
Scheduling data transfers in parallel computers and communications systems p 3836 N93-31132
Cost-effectiveness analysis of txDOT LPG fleet conversion, volume 1
[PB93-186492] p 3712 N93-31326
Cost-effectiveness analysis of txDOT LPG fleet conversion, volume 2
[PB93-186500] p 3713 N93-31327
Temporal and spatial analysis in knowledge-based physics problem-solving p 3814 N93-31651
Aerogeophysical evidence for active volcanism beneath the West Antarctic Ice Sheet p 3761 N93-31895
On the design of fault-tolerant robotic manipulator systems p 3737 N93-32125
TEXAS UNIV., DALLAS.
Studies of global ionospheric electrodynamics
[AD-A265033] p 3764 N93-31997
TEXAS UNIV. AT DALLAS, RICHARDSON.
High-latitude electric field studies using DMSP data
[AD-A265032] p 3763 N93-31996
TEXAS UNIV. HEALTH SCIENCE CENTER, SAN ANTONIO.
Investigation of laser-induced retinal damage
[AD-A264096] p 3772 N93-31094
TEXAS WATER DEVELOPMENT BOARD, AUSTIN.
Shaly sand formation evaluation in tight gas sands using electrochemical potential measurements
[PB93-163186] p 3764 N93-32087
TOGAI INFRALOGIC, INC., IRVINE, CA.
Commercial applications p 3688 N93-31441
TOKYO ASTRONOMICAL OBSERVATORY, MITAKA (JAPAN).
Observations of the quiet Sun from the soft x ray telescope on Yohkoh p 3874 N93-31388
TOKYO INST. OF TECH. (JAPAN).
Current projects in Fuzzy Control
p 3688 N93-31442
TOKYO UNIV. (JAPAN).
Observations of the quiet Sun from the soft x ray telescope on Yohkoh p 3874 N93-31388
Coordination of the solar terrestrial science by the IACG: Inter-Agency Consultative Group for Space Science
p 3852 N93-31675
Magnetospheric convection and current system in the dayside polar cap p 3856 N93-31700

TORONTO UNIV. (ONTARIO).
Orographically forced internal-wave instability
[ISBN-0-315-73891-X] p 3757 N93-31106
Personal information management in computer science research
[ISBN-0-315-73783-2] p 3842 N93-32325
TRANSPORTATION RESEARCH CENTER OF OHIO, EAST LIBERTY.
Longitudinal acceleration test of overhead luggage bins in a transport airframe section
[DOT/FAA/CT-92/9] p 3674 N93-31652
TRW SYSTEMS GROUP, REDONDO BEACH, CA.
The PIT MkV pulsed inductive thruster
[NASA-CR-191155] p 3698 N93-32353
TUEBINGEN UNIV. (GERMANY).
Calibration of ORFEUS echelle spectrometer
[ETN-93-94201] p 3691 N93-31048
ROSAT observations of quasar 3C 273
[ETN-93-94202] p 3844 N93-31049
Molecules in the envelope of planetary nebulae with the example of CO-envelope of M2-9
[ETN-93-94203] p 3851 N93-31050
Test measurements for quick analog digital converters for an x ray CCD camera
[ETN-93-94204] p 3728 N93-31119
TUFTS UNIV., MEDFORD, MA.
Gravitation of global topological defects
p 3757 N93-31130
Very Large Array (VLA) observations of coronal loops
p 3879 N93-31419
TURIN UNIV. (ITALY).
A diagnostic method for reconnecting magnetic fields in the solar corona p 3877 N93-31406
TURKU UNIV. (FINLAND).
Energetic particle analyser ERNE
p 3869 N93-31354
A double-peaked solar flare: Conclusions on particle transport p 3879 N93-31415

U

UNITED TECHNOLOGIES CORP., EAST HARTFORD, CT.
Investigation of PACVD protective coating processes using advanced diagnostics techniques
[DE93-013978] p 3711 N93-32307
UNIVERSAL ENERGY SYSTEMS, INC., DAYTON, OH.
Calculations on unsteady type 4 interaction at Mach 8
[AD-A265214] p 3673 N93-32004
UNIVERSIDAD AUTONOMA METROPOLITANA DE MEXICO (MEXICO).
Terminal project heat convection in thin cylinders
[DE93-609489] p 3723 N93-31245
UNIVERSIDADE ESTADUAL DE CAMPINAS (BRAZIL).
A generalization of Dirac non-linear electrodynamics, and spinning charged particles
[DE93-609847] p 3821 N93-31907
Free Maxwell equations, Dirac equation, and non-dispersive De Broglie wave packets
[DE93-609848] p 3832 N93-31908
UNIVERSIDADE ESTADUAL DE PAULISTA, SAO PAULO (BRAZIL).
The Lipkin model second order phase transition in the deformed su(2) algebra description
[DE93-608201] p 3807 N93-31661
Supersymmetric construction of W-algebras from super Toda and WZNW theories
[DE93-608244] p 3808 N93-31819
Complex Kohn variational principle for the solution of Lippmann-Schwinger equations
[DE93-609885] p 3814 N93-31910
On two-current realization of KP hierarchy
[DE93-609917] p 3808 N93-31912
Helicity amplitudes for matter-coupled gravity
[DE93-609932] p 3832 N93-32025
UNIVERSITEIT TWENTE, ENSCHEDE (NETHERLANDS).
Curve interpolation with constrained length
[MEMO-1079] p 3804 N93-31467
Optimal solutions to a two-block H infinity problem
[MEMO-1080] p 3798 N93-31468
Design and implementation strategies
[MEMO-INF-92-57] p 3788 N93-31511
Some new results for chain-sequence polynomials
[MEMO-1081] p 3806 N93-31515
Electromagnetic response of a superconducting wire of finite length in a perpendicular applied AC magnetic field
[MEMO-1087] p 3716 N93-31516
Sensitivity analysis of coupled bending and torsional vibrations in flexible robot arms
[MEMO-1088] p 3735 N93-31526
Roe's scheme and the MUSCL technique for the Navier-Stokes equations
[MEMO-1090] p 3725 N93-31527
The performance of integrity control through transaction modification in a parallel main-memory database system
[MEMO-INF-92-54] p 3839 N93-31615
A blueprint for a parallel parser generator
[MEMO-INF-92-65] p 3795 N93-31616
On the selection of an optimal set of secondary indices
[MEMO-INF-92-68] p 3789 N93-31617
Blocking probabilities in a loss system with arrivals in geometrically distributed batches and heterogeneous service requirements
[MEMO-1074] p 3812 N93-32392
Cycles in tough graphs: Updating the last four years
[MEMO-1091] p 3810 N93-32398
Smallest regular graphs with given diameter
[MEMO-1092] p 3810 N93-32399
Nonlinear disturbance decoupling and linearization: A partial interpretation of integral feedback
[MEMO-1093] p 3801 N93-32400
A note on dominating cycles in 2-connected graphs
[MEMO-1094] p 3810 N93-32401
UNIVERSITY OF SOUTH FLORIDA, TAMPA.
Nutritional assessment of United States tactical air command pilots p 3778 N93-32242
UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES.
Introduction to Fuzzy Set Theory
p 3689 N93-31446
CELIAS: Charge, Element and Isotope Analysis System for the SOHO mission p 3860 N93-31725
Control of jet noise
[NASA-CR-193552] p 3816 N93-32221
UNIVERSITY OF SOUTHERN MISSISSIPPI, HATTIESBURG.
Structural characterization of nylon 7 by solid-state NMR, DSC, and ATR-FTIR
[AD-A265800] p 3822 N93-32312
Synthesis and characterization of copolymers of nylon 11 and nylon 12
[AD-A265841] p 3711 N93-32314
UTRECHT STATE UNIV. (NETHERLANDS).
Retardation effects and the origin of filament oscillations p 3853 N93-31679

V

VANDERBILT UNIV., NASHVILLE, TN.
System reliability and risk assessment task goals and status p 3695 N93-31568
VIRGINIA INST. OF MARINE SCIENCE, GLOUCESTER POINT.
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 1: Executive summary
[PB93-186062] p 3770 N93-31873
Benthic study of the continental slope off Cape Hatteras, North Carolina, volume 2
[PB93-186070] p 3771 N93-32190
Benthic study of the continental slope off Cape Hatteras, North Carolina. Volume 3: Appendices
[PB93-186088] p 3771 N93-32308
VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Integrated structural design, vibration control, and aeroelastic tailoring by multiobjective optimization
p 3739 N93-31137
The method of smoothing applied to composite rough surface
[AD-A265236] p 3701 N93-32062
VIRGINIA UNIV., CHARLOTTESVILLE.
NASA-UVa light aerospace alloy and structure technology program supplement: Aluminum-based materials for high speed aircraft
[NASA-CR-4517] p 3705 N93-31643
NASA-UVA Light Aerospace Alloy and Structures Technology Program (LA2ST)
[NASA-CR-193412] p 3706 N93-31739
VON KARMAN INST. FOR FLUID DYNAMICS, RHODE-SAINT-GENESE (BELGIUM).
Parametric studies of shock wave/boundary layer interactions over 2D compression corners at Mach 6
[VKI-TN-181] p 3672 N93-31538
Vibration and Rotor Dynamics
[VKI-LS-1992-06] p 3741 N93-32270

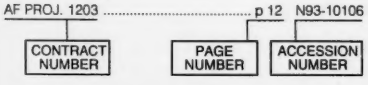
W

WASHINGTON UNIV., SEATTLE.
Reconnaissance and deep-drill site selection on Taylor Dome, Antarctica p 3759 N93-31883
Thermal control of ice-stream margins
p 3762 N93-31897
Quantum well optical waveguide modulators
[AD-A265421] p 3824 N93-32050
Two and three dimensional magnetotelluric inversion
[DE93-013233] p 3765 N93-32165
WAYNE STATE UNIV., DETROIT, MI.
Innovative instrument design and applications in super-critical fluid chromatography and extraction
p 3704 N93-32327
WEIDLINGER ASSOCIATES, LOS ALTOS, CA.
Numerical methods for inverse problems in three-dimensional geophysical modeling, phase 2
[PB93-181584] p 3758 N93-31872
WEIZMANN INST. OF SCIENCE, REHOVOTH (ISRAEL).
Quantum adiabatic expansion for dynamics in strong magnetic fields
[DE93-609388] p 3831 N93-31226
Monte-Carlo simulations of secondary electron emission from CsI, induced by 1-10 keV x rays and electrons
[DE93-604906] p 3818 N93-31239
Advances in Analysis and Detection of Explosives. Proceedings of the 4th International Symposium on Analysis and Detection of Explosives
[AD-A265002] p 3713 N93-32077
WESTINGHOUSE HANFORD CO., RICHLAND, WA.
Thulium heat sources for space power application
[DE93-002249] p 3691 N93-31168
WESTINGHOUSE SCIENCE AND TECHNOLOGY CENTER, PITTSBURGH, PA.
High temperature superconducting films and multilayers for electronics
[AD-A264410] p 3828 N93-31190
Improved gallium nitride and aluminum nitride electronic materials
[AD-A264570] p 3710 N93-32010
WICHITA STATE UNIV., KS.
Impact response of laminated plates subjected to transverse loading p 3740 N93-31645
Internation aircraft operator information system
[DOT/FAA/CT-93/4] p 3671 N93-32232
WISCONSIN UNIV., MADISON.
Changes on the ice plain of Ice Stream B and Ross Ice Shelf p 3760 N93-31889
Sensible and latent heat flux estimates in Antarctica
p 3763 N93-31902
Approximation orders of and approximation maps from local principal shift-invariant spaces
[AD-A265038] p 3808 N93-31999
WOODS HOLE OCEANOGRAPHIC INST., MA.
Tides of Massachusetts and Cape Cod Bays
[AD-A264790] p 3770 N93-31983
WORLD METEOROLOGICAL ORGANIZATION, GENEVA (SWITZERLAND).
Global changes and the air-sea exchange of chemicals
[DE93-605636] p 3750 N93-31092
WORLD WILDLIFE FUND, INC., WASHINGTON, DC.
Central Africa: Global climate change and development
[PB93-179612] p 3768 N93-31871
WYOMING UNIV., LARAMIE.
Kinetics of mediated electron transfer between viologen groups in a self-assembled monolayer and metal complexes in solution
[AD-A265729] p 3820 N93-31797
Aerosol optical properties of the free troposphere
[AD-A265795] p 3758 N93-31803
A vision system planner for increasing the autonomy of the Extravehicular Activity Helper/Retriever
[NASA-CR-193301] p 3777 N93-31844

Y

YORK UNIV., TORONTO (ONTARIO).
The interaction of a moving spacecraft with the ionosphere: Current collection and wake structure
p 3688 N93-31157

Typical Contract Number Index Listing

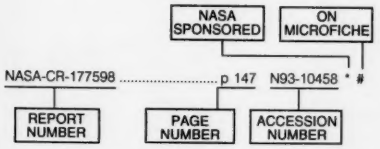


Listings in this index are arranged alphanumerically by contract number. Under each contract number the accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The page number helps to locate the citation in the abstract section. The accession number denotes the number by which the citation is identified.

AF PROJ. 2418 ..... p 3705 N93-31192
p 3738 N93-31982
AF PROJ. 3005 ..... p 3835 N93-31078
AF PROJ. 3058 ..... p 3692 N93-31291
AF PROJ. 5581 ..... p 3793 N93-32418
AF-AFOSR-0021-91 ..... p 3811 N93-32016
AF-AFOSR-0031-91 ..... p 3811 N93-32003
AF-AFOSR-0085-91 ..... p 3820 N93-31798
AF-AFOSR-0091-91 ..... p 3870 N93-31361
AF-AFOSR-0104-90 ..... p 3774 N93-32018
AF-AFOSR-0108-90 ..... p 3773 N93-31981
AF-AFOSR-0131-91 ..... p 3801 N93-32413
AF-AFOSR-0138-91 ..... p 3792 N93-32096
AF-AFOSR-0175-91 ..... p 3774 N93-32015
AF-AFOSR-0207-89 ..... p 3817 N93-31063
AF-AFOSR-0208-91 ..... p 3772 N93-31094
AF-AFOSR-0211-91 ..... p 3832 N93-32072
AF-AFOSR-0244-90 ..... p 3772 N93-31061
AF-AFOSR-0244-91 ..... p 3877 N93-31402
AF-AFOSR-0250-91 ..... p 3727 N93-32095
AF-AFOSR-0275-88 ..... p 3743 N93-31060
AF-AFOSR-0350-91 ..... p 3843 N93-32153
AF-AFOSR-0436-91 ..... p 3753 N93-32027
AF-AFOSR-0549-89 ..... p 3823 N93-31799
AF-AFOSR-1-5-26932 ..... p 3843 N93-32150
AF-AFOSR-85-0237 ..... p 3857 N93-31706
AID-DHR-5554-A-00-8044-03 ..... p 3768 N93-31871
ARPA ORDER 6661/50 ..... p 3794 N93-32141
ARPA ORDER 7526 ..... p 3732 N93-32052
ARPA ORDER 7597 ..... p 3841 N93-32048
p 3842 N93-32049
p 3791 N93-32066
ARPA ORDER 8930 ..... p 3796 N93-32080
CAS-30301 ..... p 3872 N93-31372
CDDF PROJ. 90-10 ..... p 3706 N93-31646
CICYT-ESP-88-0306 ..... p 3869 N93-31353
CICYT-ESP88-0306-C02-02 ..... p 3860 N93-31721
DA PROJ. X15-96 ..... p 3768 N93-31922
DA PROJ. 1L1-62211-A-47-A ..... p 3735 N93-31846
DA PROJ. 2Q1-62785-A-790 ..... p 3777 N93-32012
DA PROJ. 2Q2-63007-A-792 ..... p 3776 N93-32011
DAAL03-G-90-0090 ..... p 3808 N93-31999
DAAL03-86-D-0001 ..... p 3776 N93-32011
DAAL03-89-C-0032 ..... p 3727 N93-32329
DAAL03-92-G-0324 ..... p 3715 N93-31096
DAAL04-92-C-0009 ..... p 3707 N93-32318
DAJA45-92-M-0117 ..... p 3713 N93-32077
DAJA45-93-M-0131 ..... p 3784 N93-31087
DAMD17-86-C-6260 ..... p 3772 N93-32035
DARA-50-OC-8910 ..... p 3869 N93-31353
DARA-50-QN-9102-3 ..... p 3856 N93-31698
DE-AC02-76CH-00016 ..... p 3824 N93-31987
DE-AC02-76CH-03000 ..... p 3822 N93-32294
DE-AC02-83CH-10093 ..... p 3750 N93-32177
p 3750 N93-32282
p 3732 N93-32288
DE-AC03-76SF-00515 ..... p 3833 N93-32181
DE-AC04-76DP-00789 ..... p 3723 N93-31169
p 3786 N93-31183
p 3735 N93-31790
p 3715 N93-32104
DE-AC04-76DR-00789 ..... p 3732 N93-32180
DE-AC05-84OR-21400 ..... p 3830 N93-32183
p 3800 N93-32305
p 3730 N93-32306
p 3718 N93-32425
p 3816 N93-32301
p 3719 N93-32114
p 3710 N93-32161
p 3736 N93-32179
p 3750 N93-32281
p 3707 N93-32302
p 3727 N93-32303
DE-AC05-84OS-21400 ..... p 3704 N93-31184
DE-AC06-76RL-01830 ..... p 3830 N93-32182
p 3732 N93-32304
DE-AC06-87RL-10930 ..... p 3691 N93-31168
DE-AC07-76ID-01570 ..... p 3698 N93-32184
p 3718 N93-32283
DE-AC21-88MC-25168 ..... p 3721 N93-32174
DE-FG02-85ER-60372 ..... p 3769 N93-32289
DE-FG02-86ER-13560 ..... p 3711 N93-32307
DE-FG02-87ER-13740 ..... p 3833 N93-32290
DE-FG02-90ER-45413 ..... p 3815 N93-32291
DE-FG02-91CE-23810 ..... p 3715 N93-32163
p 3711 N93-32292
p 3711 N93-32293
DE-FG02-91ER-40635 ..... p 3851 N93-32160
DE-FG02-92ER-75709 ..... p 3796 N93-31986
DE-FG05-84ER-13266 ..... p 3822 N93-32162
DE-FG06-85ER-40224 ..... p 3822 N93-32159
DE-FG06-86ER-13530 ..... p 3765 N93-32164
DE-FG06-89ER-14064 ..... p 3765 N93-32165
DE-FG06-91ER-40614 ..... p 3822 N93-32159
DFG-GE490/4 ..... p 3852 N93-31091
DFG-WI259/8 ..... p 3854 N93-31686
DI-14-08-0001-G1436 ..... p 3767 N93-31206
DI-14-08-0001-G1576 ..... p 3767 N93-31206
DI-14-08-0001-G1578-02 ..... p 3723 N93-31204
DI-14-08-0001-G1914 ..... p 3751 N93-31203
DI-14-35-0001-30672 ..... p 3770 N93-31873
p 3771 N93-32190
p 3771 N93-32308
DNA001-89-C-0080 ..... p 3715 N93-31867
p 3791 N93-32034
DTFA03-88-C-00066 ..... p 3674 N93-31652
DTFA03-90-C-00010 ..... p 3678 N93-32336
DTFR53-91-C-00046 ..... p 3735 N93-31592
DTFR53-91-C-00062 ..... p 3736 N93-32192
DTFR53-91-C-00067 ..... p 3736 N93-32086
DTFR53-91-C-00071 ..... p 3736 N93-32194
DTFR53-91-C-00074 ..... p 3736 N93-32193
DTFR53-91-C-00076 ..... p 3735 N93-31727
EN3W-0041-D ..... p 3700 N93-31461
EPA-68-C0-0003 ..... p 3754 N93-32089
EPA-68-WO-0043 ..... p 3754 N93-32070
EPA-68-03-3484 ..... p 3715 N93-32408
ESA-8522/89/NL/SF ..... p 3823 N93-31118
ESA-9301/91/NL/MS ..... p 3849 N93-31780
FNSRS-12-26434.89 ..... p 3790 N93-31659
F04701-88-C-0089 ..... p 3702 N93-31064
p 3857 N93-31706
F04701-91-C-0026 ..... p 3716 N93-31311
F19628-89-C-0001 ..... p 3718 N93-32313
F19628-89-K-0010 ..... p 3701 N93-32062
F19628-90-C-0002 ..... p 3717 N93-31989
p 3850 N93-31990
F19628-90-C-0003 ..... p 3790 N93-31793
p 3791 N93-32000
F19628-90-K-0001 ..... p 3764 N93-31997
F19628-90-K-0002 ..... p 3763 N93-31996
F19628-90-K-0011 ..... p 3758 N93-31803
F19628-91-C-0152 ..... p 3756 N93-31062
F30602-88-C-0001 ..... p 3835 N93-32133
F30602-90-C-0021 ..... p 3791 N93-32007
p 3791 N93-32022
p 3791 N93-32023
p 3791 N93-32024
F33615-90-C-1465 ..... p 3841 N93-32048
p 3842 N93-32049
p 3791 N93-32066
F33615-90-C-2089 ..... p 3673 N93-32004
F49620-89-C-0008 ..... p 3764 N93-32084
F49620-89-C-0119 ..... p 3800 N93-32197
F49620-91-C-0023 ..... p 3829 N93-32083
F49620-91-C-0032 ..... p 3710 N93-32010
F49620-91-C-0034 ..... p 3828 N93-31190
F49620-92-C-0039 ..... p 3691 N93-31188
F49620-92-J-0015 ..... p 3873 N93-31377
F49620-92-J-0023 ..... p 3726 N93-32014
F49620-92-J-0066 ..... p 3732 N93-31866
F49620-92-J-0078 ..... p 3808 N93-31857
F49620-92-J-0137 ..... p 3766 N93-31182
F49620-92-J-0149 ..... p 3808 N93-32017
F49620-92-J-0160 ..... p 3829 N93-31804
GRI-P9987-0275-S ..... p 3764 N93-32087
GRI-5084-238-1302 ..... p 3699 N93-31870
GRI-5086-260-1326 ..... p 3702 N93-31435
GRI-5087-260-1535 ..... p 3723 N93-31210
GRI-5090-260-2145 ..... p 3724 N93-31438
GRI-5091-260-2238 ..... p 3702 N93-31209
GRI-5091-271-2187 ..... p 3700 N93-31334
GRI-5091-292-2153 ..... p 3713 N93-31434
IOP-TK-90A211 ..... p 3709 N93-31541
MDA903-86-C-0384 ..... p 3777 N93-32012
MDA903-90-C-0006 ..... p 3713 N93-32085
MDA904-89-H-2008 ..... p 3810 N93-32398
p 3810 N93-32401
MDA972-90-C-0005 ..... p 3794 N93-32141
MDA972-90-C-0035 ..... p 3791 N93-32044
MDA972-90-C-0046 ..... p 3732 N93-32052
MDA972-91-C-0004 ..... p 3800 N93-32169
MDA972-91-C-0030 ..... p 3721 N93-32033
NAGW-1206 ..... p 3882 N93-32222
NAGW-1333 ..... p 3789 N93-31638
NAGW-1355 ..... p 3845 N93-31758
NAGW-1541 ..... p 3871 N93-31365
NAGW-1592 ..... p 3800 N93-32341
NAGW-1638 ..... p 3766 N93-31680
NAGW-1674 ..... p 3845 N93-31758
NAGW-2002 ..... p 3870 N93-31361
NAGW-2019 ..... p 3844 N93-31604
NAGW-2087 ..... p 3853 N93-31681
NAGW-2265 ..... p 3873 N93-31377
NAGW-2381 ..... p 3861 N93-31837
NAGW-2383 ..... p 3879 N93-31419
NAGW-2497 ..... p 3845 N93-31758
NAGW-249 ..... p 3877 N93-31402
NAGW-2760 ..... p 3871 N93-31365
NAGW-2779 ..... p 3853 N93-31681
NAGW-3080 ..... p 3874 N93-31387
NAGW-9 ..... p 3870 N93-31360
p 3860 N93-31723
NAG1-1009 ..... p 3795 N93-31640
NAG1-1056 ..... p 3684 N93-31836
NAG1-1058 ..... p 3715 N93-31110
NAG1-1096 ..... p 3816 N93-32221
NAG1-1327 ..... p 3812 N93-32350
NAG1-1397 ..... p 3809 N93-32373
NAG1-1426 ..... p 3790 N93-31738
NAG1-613 ..... p 3843 N93-32150
p 3785 N93-32233
p 3796 N93-32355
NAG1-745 ..... p 3705 N93-31643
p 3706 N93-31739
NAG1-763 ..... p 3737 N93-32235
NAG1-767 ..... p 3684 N93-31848
NAG1-804 ..... p 3756 N93-31041
p 3766 N93-32231
NAG2-559 ..... p 3725 N93-31641
NAG2-757 ..... p 3793 N93-32361
NAG2-823 ..... p 3792 N93-32239
NAG3-1011 ..... p 3728 N93-32371
NAG3-555 ..... p 3698 N93-31588
NAG5-605 ..... p 3851 N93-32363
NAG5-613 ..... p 3871 N93-31367
p 3880 N93-31422
NAG8-866 ..... p 3686 N93-32236
NAG9-117 ..... p 3774 N93-32364
NAG9-532 ..... p 3709 N93-31636
NAG9-614 ..... p 3823 N93-31841
NAG9-634 ..... p 3777 N93-31844
NANB-8H0840 ..... p 3722 N93-31114
NASA ORDER L-20278-D ..... p 3784 N93-31649
NASA ORDER L-54880-C ..... p 3727 N93-32329
NASA ORDER PR-537313 ..... p 3735 N93-31731
NASA ORDER S-93835-D ..... p 3868 N93-31350

NASW-4574 ..... p 3861 N93-31933
NASW-4699 ..... p 3851 N93-32324
NAS1-17964 ..... p 3795 N93-31642
NAS1-18585 ..... p 3673 N93-31733
NAS1-18605 ..... p 3808 N93-31857
p 3816 N93-31868
p 3793 N93-32359
NAS1-18796 ..... p 3701 N93-32234
NAS1-19038 ..... p 3680 N93-32218
NAS1-19291 ..... p 3698 N93-32353
NAS1-19480 ..... p 3803 N93-31194
p 3808 N93-31843
p 3808 N93-31857
p 3816 N93-31868
p 3792 N93-32323
p 3793 N93-32359
NAS2-13340 ..... p 3835 N93-32134
NAS3-26130 ..... p 3696 N93-31577
NAS5-30386 ..... p 3867 N93-31345
NAS5-30431 ..... p 3879 N93-31416
NAS5-31207 ..... p 3766 N93-31680
NAS5-31250 ..... p 3880 N93-31422
NAS7-1052 ..... p 3691 N93-31040
NAS8-36955 ..... p 3766 N93-32349
NAS8-37334 ..... p 3873 N93-31377
p 3874 N93-31388
NAS8-37814 ..... p 3772 N93-32354
p 3783 N93-32356
p 3772 N93-32365
NAS8-38609 ..... p 3789 N93-31637
p 3800 N93-32230
NAS8-39131 ..... p 3784 N93-31849
NAS8-39811 ..... p 3698 N93-31845
NAS9-18426 ..... p 3690 N93-32228
NATO-RG86/0080 ..... p 3844 N93-31753
NAVF-438.92/002 ..... p 3877 N93-31402
NA90AA-D-SG424 ..... p 3786 N93-31199
NCC1-166 ..... p 3833 N93-32229
NCC2-659 ..... p 3816 N93-32236
NCC2-701 ..... p 3673 N93-31855
NCC3-233 ..... p 3723 N93-31147
p 3727 N93-32199
p 3809 N93-32200
p 3727 N93-32370
NGT-26-027-011 ..... p 3792 N93-32322
NIOSH-R43-OH02097 ..... p 3773 N93-31138
NIVR-01904N ..... p 3674 N93-32358
NIVR-02506N ..... p 3736 N93-32204
p 3737 N93-32333
NIVR-02607N ..... p 3823 N93-31056
p 3823 N93-31118
NIVR-07801N ..... p 3679 N93-32338
NOAA-50RANR000104 ..... p 3860 N93-31723
NOAA/SEL-50RANR000104 ..... p 3854 N93-31685
NR PROJ. R21-43 ..... p 3701 N93-32067
NSC-82-F-SP-007-02 ..... p 3849 N93-31778
NSF ATM-90-19893 ..... p 3871 N93-31365
NSF CCR-91-03296 ..... p 3808 N93-31843
NSF CDS-88-227240 ..... p 3796 N93-32080
NSF DMS-91-02857 ..... p 3808 N93-31999
NSF DMS-92-06991 ..... p 3810 N93-32398
p 3810 N93-32401
NSF ECS-88-11234 ..... p 3811 N93-31503
NSF INT-89-2249 ..... p 3808 N93-31857
NSF IRI-89-16059 ..... p 3843 N93-32153
NSF ISI-86-19607 ..... p 3758 N93-31872
NSF ISI-88-60275 ..... p 3703 N93-31875
NSF ISI-88-60898 ..... p 3720 N93-31876
NSG-7176 ..... p 3845 N93-31758
NUTEK-92-01540P ..... p 3723 N93-31146
NWO-611-304-028 ..... p 3790 N93-31659
N00014-81-C-0582 ..... p 3791 N93-32059
N00014-84-C-0256 ..... p 3733 N93-32402
N00014-84-C-0473 ..... p 3791 N93-32059
N00014-86-K-0396 ..... p 3829 N93-32002
N00014-86-K-0678 ..... p 3777 N93-32064
N00014-87-J-1248 ..... p 3821 N93-32032
N00014-88-K-4130 ..... p 3704 N93-31919
N00014-89-D-0142 ..... p 3769 N93-32171
p 3771 N93-32172
N00014-89-J-1178 ..... p 3710 N93-31991
p 3721 N93-31994
p 3826 N93-31998
N00014-89-J-1181 ..... p 3794 N93-32147
N00014-89-J-1225 ..... p 3822 N93-32312
p 3711 N93-32314
N00014-89-J-1235 ..... p 3731 N93-31095
N00014-89-J-1754 ..... p 3764 N93-32094
N00014-89-J-1889 ..... p 3771 N93-32320
N00014-89-J-3104 ..... p 3817 N93-32317
N00014-90-J-1148 ..... p 3710 N93-31801
p 3710 N93-31802
p 3750 N93-32417
N00014-90-J-1161 ..... p 3721 N93-32001
N00014-90-J-1167 ..... p 3820 N93-31797
N00014-90-J-1209 ..... p 3819 N93-31791
N00014-90-J-1268 ..... p 3819 N93-31792
N00014-90-J-1270 ..... p 3769 N93-31082
N00014-90-J-1556 ..... p 3785 N93-32233
N00014-91-C-0124 ..... p 3701 N93-32067
N00014-91-J-1116 ..... p 3706 N93-31795
N00014-91-J-1274 ..... p 3785 N93-32233
N00014-91-J-1316 ..... p 3707 N93-31066
N00014-91-J-1441 ..... p 3799 N93-32073
N00014-91-J-1550 ..... p 3721 N93-31984
p 3704 N93-31920
p 3829 N93-31921
p 3829 N93-32045
N00014-91-J-1628 ..... p 3717 N93-31794
N00014-91-J-1662 ..... p 3824 N93-32050
N00014-91-J-1664 ..... p 3710 N93-31993
N00014-91-J-1710 ..... p 3704 N93-31918
N00014-91-J-4059 ..... p 3733 N93-31101
N00014-91-J-4136 ..... p 3791 N93-32066
N00014-92-C-0150 ..... p 3729 N93-31191
N00014-92-J-1146 ..... p 3843 N93-32150
N00014-92-J-1190 ..... p 3717 N93-32046
N00014-92-J-1561 ..... p 3809 N93-32076
N00014-92-J-1616 ..... p 3746 N93-32173
N00014-92-J-1777 ..... p 3727 N93-32310
N00014-92-J-1801 ..... p 3796 N93-32080
N00014-92-J-1815 ..... p 3794 N93-32147
N00014-92-J-1996 ..... p 3719 N93-31080
N00014-93-1-0147 ..... p 3713 N93-31800
N00014-93-1-0216 ..... p 3770 N93-32037
N00039-88-C-0051 ..... p 3726 N93-32071
OTKA-1813 ..... p 3853 N93-31678
OTKA-2116 ..... p 3790 N93-31659
PCSR-2-2150-90-03P/24 ..... p 3879 N93-31418
PROJ. 91-23 ..... p 3824 N93-32378
RTOP 303-50-00 ..... p 3713 N93-32330
RTOP 505-53-1A ..... p 3712 N93-32367
RTOP 505-59-10 ..... p 3673 N93-32226
RTOP 505-59-30-01 ..... p 3673 N93-31733
RTOP 505-59-50-01 ..... p 3727 N93-32329
RTOP 505-59-85-01 ..... p 3796 N93-32224
RTOP 505-60-01-02 ..... p 3673 N93-31732
RTOP 505-62-10 ..... p 3735 N93-31846
p 3682 N93-32351
p 3683 N93-32368
RTOP 505-62-50 ..... p 3808 N93-31847
RTOP 505-62-52 ..... p 3725 N93-31647
p 3672 N93-31648
p 3672 N93-31672
p 3673 N93-31839
p 3726 N93-31860
RTOP 505-63-5A ..... p 3711 N93-32352
RTOP 505-64-10-07 ..... p 3812 N93-31869
RTOP 505-64-12-01 ..... p 3680 N93-32223
RTOP 505-64-13 ..... p 3680 N93-32218
RTOP 505-64-30-01 ..... p 3684 N93-32380
RTOP 505-64-36 ..... p 3678 N93-32225
p 3678 N93-32348
RTOP 505-69-50 ..... p 3740 N93-32212
RTOP 505-90-5K ..... p 3723 N93-31147
p 3727 N93-32199
p 3809 N93-32200
p 3727 N93-32370
RTOP 505-90-52-01 ..... p 3803 N93-31194
p 3808 N93-31843
p 3808 N93-31857
p 3816 N93-31868
p 3793 N93-32359
RTOP 506-41-11 ..... p 3750 N93-32201
RTOP 506-41-41 ..... p 3812 N93-31145
RTOP 506-42-42 ..... p 3698 N93-32353
RTOP 506-46-21-56 ..... p 3795 N93-31642
RTOP 506-59-61-05 ..... p 3715 N93-32227
RTOP 506-62-31 ..... p 3683 N93-32374
RTOP 506-72-21 ..... p 3717 N93-31856
RTOP 509-10-04 ..... p 3796 N93-32213
RTOP 509-10-11 ..... p 3740 N93-31193
RTOP 510-01-50 ..... p 3701 N93-32219
p 3712 N93-32382
RTOP 532-06-37-03 ..... p 3701 N93-32234
RTOP 537-02-00 ..... p 3681 N93-31671
RTOP 537-03-20 ..... p 3682 N93-32220
RTOP 553-13-00 ..... p 3692 N93-31552
RTOP 584-03-11 ..... p 3686 N93-31670
RTOP 584-04-21 ..... p 3698 N93-31858
RTOP 593-42-21-01 ..... p 3822 N93-32369
RTOP 680-00-00 ..... p 3861 N93-31737
RTOP 763-23-45-86 ..... p 3705 N93-31643
RTOP 879-11-38 ..... p 3875 N93-31390
RTOP 906-11-01-01 ..... p 3687 N93-32379
RTOP 946-01-00-82 ..... p 3690 N93-32381
RTOP 971-00-00 ..... p 3758 N93-31878
SAS-494 ..... p 3872 N93-31372
SAS-59 ..... p 3872 N93-31372
SC1-0255-C ..... p 3876 N93-31396
SERC-ACME-GR/6-38375 ..... p 3728 N93-31125
SERC-GR-G-10517 ..... p 3879 N93-31418
SERC-GR/H09454 ..... p 3826 N93-31683
STW-GWI27.0277 ..... p 3725 N93-31519
US-HUN-35/90 ..... p 3853 N93-31678
W-7405-ENG-36 ..... p 3691 N93-31185
p 3712 N93-31186
p 3727 N93-32175
p 3765 N93-32176
p 3711 N93-32186
p 3842 N93-32298
p 3792 N93-32299
p 3822 N93-32300
W-7405-ENG-48 ..... p 3744 N93-31187
p 3795 N93-31985
p 3796 N93-31986
p 3829 N93-31988
p 3766 N93-32295
p 3706 N93-32296
p 3766 N93-32297

Typical Report Number Index Listing



Listings in this index are arranged alphanumerically by report number. The accession number denotes the number by which the citation is identified. The page number helps to locate the citation in the abstract section. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-90195 ..... p 3683 N93-32374 * #
A-92099 ..... p 3740 N93-32212 * #
A-93012 ..... p 3673 N93-32226 * #
A-93033 ..... p 3678 N93-32225 * #
A-93087 ..... p 3678 N93-32348 * #

AD-A258533 ..... p 3788 N93-31548 #
AD-A263360 ..... p 3719 N93-31080 #
AD-A263394 ..... p 3835 N93-31078 #
AD-A264004 ..... p 3692 N93-31291 #
AD-A264084 ..... p 3769 N93-31082 #
AD-A264089 ..... p 3719 N93-31085 #
AD-A264091 ..... p 3784 N93-31087 #
AD-A264092 ..... p 3743 N93-31060 #
AD-A264096 ..... p 3772 N93-31094 #
AD-A264099 ..... p 3772 N93-31061 #
AD-A264106 ..... p 3753 N93-32027 #
AD-A264111 ..... p 3726 N93-32028 #
AD-A264112 ..... p 3701 N93-32029 #
AD-A264113 ..... p 3713 N93-32030 #
AD-A264114 ..... p 3717 N93-32031 #
AD-A264156 ..... p 3756 N93-31062 #
AD-A264210 ..... p 3733 N93-32402 #
AD-A264266 ..... p 3731 N93-31095
AD-A264268 ..... p 3715 N93-31096
AD-A264294 ..... p 3766 N93-31182
AD-A264296 ..... p 3829 N93-32083
AD-A264300 ..... p 3764 N93-32084
AD-A264302 ..... p 3713 N93-32085
AD-A264303 ..... p 3732 N93-31866
AD-A264344 ..... p 3817 N93-31063 #
AD-A264365 ..... p 3715 N93-31867
AD-A264376 ..... p 3801 N93-32413
AD-A264378 ..... p 3821 N93-32032
AD-A264381 ..... p 3721 N93-32033
AD-A264397 ..... p 3718 N93-32414
AD-A264402 ..... p 3791 N93-32034
AD-A264405 ..... p 3691 N93-31188 #
AD-A264410 ..... p 3828 N93-31190 #
AD-A264411 ..... p 3729 N93-31191 #
AD-A264414 ..... p 3705 N93-31192 #
AD-A264415 ..... p 3772 N93-32035
AD-A264500 ..... p 3767 N93-31195 #
AD-A264501 ..... p 3799 N93-32036 #
AD-A264570 ..... p 3710 N93-32010 #
AD-A264571 ..... p 3776 N93-32011 #
AD-A264575 ..... p 3777 N93-32012 #
AD-A264581 ..... p 3812 N93-32013 #
AD-A264640 ..... p 3726 N93-32014 #
AD-A264675 ..... p 3774 N93-32015 #
AD-A264676 ..... p 3811 N93-32016 #
AD-A264677 ..... p 3808 N93-32017 #
AD-A264681 ..... p 3774 N93-32018 #
AD-A264691 ..... p 3773 N93-31981 #
AD-A264762 ..... p 3738 N93-31982 #
AD-A264790 ..... p 3770 N93-31983 #
AD-A264882 ..... p 3733 N93-31101 #
AD-A264888 ..... p 3721 N93-31984 #
AD-A264896 ..... p 3702 N93-31064 #
AD-A264898 ..... p 3699 N93-31065 #
AD-A264903 ..... p 3707 N93-31066 #
AD-A264908 ..... p 3764 N93-32094 #
AD-A264933 ..... p 3726 N93-32071 #
AD-A264935 ..... p 3832 N93-32072 #
AD-A264936 ..... p 3799 N93-32073 #
AD-A264946 ..... p 3687 N93-32074 #
AD-A264951 ..... p 3770 N93-32075 #
AD-A264964 ..... p 3809 N93-32076 #
AD-A265002 ..... p 3713 N93-32077 #
AD-A265003 ..... p 3799 N93-32078 #
AD-A265005 ..... p 3721 N93-32079 #
AD-A265008 ..... p 3796 N93-32080 #
AD-A265012 ..... p 3686 N93-32081 #
AD-A265031 ..... p 3799 N93-32082 #
AD-A265032 ..... p 3763 N93-31996 #
AD-A265033 ..... p 3764 N93-31997 #
AD-A265036 ..... p 3826 N93-31998 #
AD-A265038 ..... p 3808 N93-31999 #
AD-A265110 ..... p 3819 N93-31791
AD-A265118 ..... p 3819 N93-31792
AD-A265145 ..... p 3717 N93-31989 #
AD-A265146 ..... p 3850 N93-31990 #
AD-A265151 ..... p 3710 N93-31991 #
AD-A265163 ..... p 3799 N93-31992
AD-A265184 ..... p 3710 N93-31993 #
AD-A265198 ..... p 3721 N93-31994 #
AD-A265201 ..... p 3790 N93-31793
AD-A265202 ..... p 3791 N93-32000 #
AD-A265208 ..... p 3721 N93-32001 #
AD-A265212 ..... p 3829 N93-32002 #
AD-A265213 ..... p 3811 N93-32003 #
AD-A265214 ..... p 3673 N93-32004 #
AD-A265216 ..... p 3768 N93-32005 #
AD-A265218 ..... p 3791 N93-32059 #
AD-A265220 ..... p 3777 N93-32006 #
AD-A265232 ..... p 3717 N93-32060 #
AD-A265234 ..... p 3690 N93-32061 #
AD-A265236 ..... p 3701 N93-32062 #
AD-A265256 ..... p 3717 N93-31794
AD-A265333 ..... p 3768 N93-32063 #
AD-A265406 ..... p 3768 N93-32043 #
AD-A265408 ..... p 3791 N93-32044 #
AD-A265409 ..... p 3829 N93-32045 #
AD-A265412 ..... p 3717 N93-32046 #
AD-A265415 ..... p 3826 N93-32047 #
AD-A265416 ..... p 3841 N93-32048 #
AD-A265417 ..... p 3842 N93-32049 #
AD-A265421 ..... p 3824 N93-32050 #
AD-A265422 ..... p 3768 N93-32051 #
AD-A265428 ..... p 3770 N93-32037 #
AD-A265441 ..... p 3732 N93-32019 #
AD-A265442 ..... p 3826 N93-32020 #
AD-A265443 ..... p 3732 N93-32021 #
AD-A265450 ..... p 3777 N93-32064 #
AD-A265451 ..... p 3706 N93-31795
AD-A265467 ..... p 3791 N93-32022 #
AD-A265468 ..... p 3791 N93-32023 #
AD-A265470 ..... p 3791 N93-32024 #
AD-A265473 ..... p 3791 N93-32007 #
AD-A265474 ..... p 3718 N93-32065 #
AD-A265489 ..... p 3821 N93-31995 #
AD-A265492 ..... p 3768 N93-32008 #
AD-A265493 ..... p 3764 N93-32009 #
AD-A265497 ..... p 3773 N93-31917 #
AD-A265513 ..... p 3704 N93-31918 #
AD-A265524 ..... p 3704 N93-31919 #
AD-A265531 ..... p 3704 N93-31920 #
AD-A265544 ..... p 3829 N93-31921 #
AD-A265548 ..... p 3791 N93-32066
AD-A265550 ..... p 3824 N93-31915 #
AD-A265551 ..... p 3685 N93-31916 #
AD-A265556 ..... p 3701 N93-32067
AD-A265575 ..... p 3732 N93-32052 #
AD-A265585 ..... p 3768 N93-31922 #
AD-A265594 ..... p 3727 N93-32095 #
AD-A265595 ..... p 3792 N93-32096 #
AD-A265613 ..... p 3800 N93-32169 #
AD-A265648 ..... p 3809 N93-32170 #
AD-A265669 ..... p 3800 N93-32197 #
AD-A265686 ..... p 3839 N93-31796 #
AD-A265729 ..... p 3820 N93-31797 #
AD-A265730 ..... p 3820 N93-31798 #
AD-A265734 ..... p 3823 N93-31799 #
AD-A265749 ..... p 3829 N93-31804 #
AD-A265775 ..... p 3713 N93-31800 #
AD-A265778 ..... p 3800 N93-32334 #
AD-A265779 ..... p 3690 N93-32335 #
AD-A265780 ..... p 3750 N93-32417 #
AD-A265782 ..... p 3727 N93-32310 #
AD-A265787 ..... p 3710 N93-31801 #
AD-A265788 ..... p 3710 N93-31802 #
AD-A265795 ..... p 3758 N93-31803 #
AD-A265796 ..... p 3834 N93-32311 #
AD-A265800 ..... p 3822 N93-32312 #
AD-A265804 ..... p 3718 N93-32313 #
AD-A265841 ..... p 3711 N93-32314 #
AD-A265856 ..... p 3809 N93-32315 #
AD-A265863 ..... p 3816 N93-32316 #
AD-A265864 ..... p 3817 N93-32317 #
AD-A265866 ..... p 3793 N93-32418 #
AD-A265867 ..... p 3707 N93-32318 #
AD-A265868 ..... p 3685 N93-32319 #
AD-A265871 ..... p 3769 N93-32171
AD-A265872 ..... p 3771 N93-32172
AD-A265874 ..... p 3746 N93-32173
AD-A265910 ..... p 3771 N93-32320 #

AD-B168787L ..... p 3679 N93-32205 #
AD-B168788L ..... p 3678 N93-32337 #
AD-B168789L ..... p 3707 N93-32385 #
AD-B168790L ..... p 3683 N93-32372 #
AD-B168792L ..... p 3674 N93-32357 #
AD-B169111L ..... p 3737 N93-32333 #
AD-B169113L ..... p 3674 N93-32358 #
AD-B169115L ..... p 3823 N93-31056 #
AD-B169116L ..... p 3736 N93-32204 #
AD-B169117L ..... p 3714 N93-32387 #
AD-B169203L ..... p 3679 N93-32203 #
AD-B169204L ..... p 3680 N93-32332 #
AD-B169205L ..... p 3680 N93-32416 #
AD-B169208L ..... p 3679 N93-31840 #
AD-B169209L ..... p 3701 N93-32202 #
AD-B169597L ..... p 3679 N93-32338 #
AD-B169664L ..... p 3683 N93-32386 #

AD-D015700 ..... p 3720 N93-31842
AD-D015734 ..... p 3830 N93-32206
AD-D015735 ..... p 3722 N93-32207
AD-D015736 ..... p 3730 N93-32208
AD-D015737 ..... p 3711 N93-32209
AD-D015738 ..... p 3718 N93-32210
AD-D015739 ..... p 3830 N93-32211

AD-E201462 ..... p 3758 N93-31803 #

AECS-S/RSS-41 ..... p 3827 N93-31077

AFIT/CI/CIA-92-113 ..... p 3768 N93-32051 #
AFIT/CI/CIA-92-116 ..... p 3768 N93-32043 #
AFIT/CI/CIA-92-118 ..... p 3764 N93-32009 #
AFIT/CI/CIA-92-121 ..... p 3768 N93-32008 #
AFIT/CI/CIA-92-122 ..... p 3768 N93-32063 #
AFIT/CI/CIA-92-137 ..... p 3826 N93-32047 #

AFOSR-93-0212TR ..... p 3801 N93-32413
AFOSR-93-0221TR ..... p 3691 N93-31188 #
AFOSR-93-0239TR ..... p 3766 N93-31182
AFOSR-93-0250TR ..... p 3817 N93-31063 #
AFOSR-93-0252TR ..... p 3773 N93-31981 #
AFOSR-93-0264TR ..... p 3828 N93-31190 #
AFOSR-93-0286TR ..... p 3829 N93-32083
AFOSR-93-0293TR ..... p 3764 N93-32084
AFOSR-93-0303TR ..... p 3753 N93-32027 #
AFOSR-93-0304TR ..... p 3772 N93-31094 #
AFOSR-93-0306TR ..... p 3772 N93-31061 #
AFOSR-93-0307TR ..... p 3732 N93-31866
AFOSR-93-0315TR ..... p 3743 N93-31060 #
AFOSR-93-0320TR ..... p 3808 N93-32017 #
AFOSR-93-0321TR ..... p 3726 N93-32014 #
AFOSR-93-0326TR ..... p 3811 N93-32016 #
AFOSR-93-0335TR ..... p 3774 N93-32018 #

AFOSR-93-0336TR ..... p 3774 N93-32015 #
AFOSR-93-0347TR ..... p 3710 N93-32010 #
AFOSR-93-0355TR ..... p 3832 N93-32072 #
AFOSR-93-0360TR ..... p 3811 N93-32003 #
AFOSR-93-0385TR ..... p 3829 N93-31804 #
AFOSR-93-0389TR ..... p 3800 N93-32197 #
AFOSR-93-0395TR ..... p 3823 N93-31799 #
AFOSR-93-0400TR ..... p 3820 N93-31798 #
AFOSR-93-0403TR ..... p 3792 N93-32096 #
AFOSR-93-0405TR ..... p 3727 N93-32095 #

AFRA-A31-92-0008 ..... p 3736 N93-32086 #

AGARD-CP-523 ..... p 3836 N93-31215 #
AGARD-CP-533 ..... p 3777 N93-32240 #

AGARD-R-766-ADD ..... p 3681 N93-31741 #

AIAA PAPER 93-1797 ..... p 3725 N93-31647 * #
AIAA PAPER 93-1927 ..... p 3809 N93-32200 * #
AIAA PAPER 93-1936 ..... p 3698 N93-31858 * #
AIAA PAPER 93-2521 ..... p 3683 N93-32368 * #
AIAA PAPER 93-2538 ..... p 3686 N93-31670 * #
AIAA PAPER 93-3253 ..... p 3672 N93-31648 * #
AIAA PAPER 93-3263 ..... p 3672 N93-31672 * #

AID-PN-ABL-401 ..... p 3768 N93-31871 #

ARCCB-TR-93013 ..... p 3718 N93-32065 #

ARI-TR-974 ..... p 3777 N93-32012 #
ARI-TR-975 ..... p 3776 N93-32011 #

ARL-CR-56 ..... p 3707 N93-32318 #

ARL-MR-60 ..... p 3717 N93-32031 #
ARL-MR-64 ..... p 3687 N93-32074 #
ARL-MR-91 ..... p 3725 N93-31647 * #

ARL-TR-105 ..... p 3701 N93-32029 #
ARL-TR-111 ..... p 3685 N93-31916 #
ARL-TR-112 ..... p 3726 N93-32028 #
ARL-TR-127 ..... p 3713 N93-32030 #
ARL-TR-53 ..... p 3816 N93-32316 #

ARO-30430.1-PH-CF ..... p 3715 N93-31096

ATN-9301 ..... p 3742 N93-32331 #

AVSCOM-TR-92-C-034 ..... p 3735 N93-31846 * #

BA-92-29 ..... p 3832 N93-31663 #

BCI-029-1 ..... p 3691 N93-31188 #

BM-IC-9338 ..... p 3743 N93-31115 #
BM-IC-9342 ..... p 3743 N93-31116

BM-RI-9456 ..... p 3702 N93-31198 #

BNL-48490 ..... p 3824 N93-31987 #

BR-311135 ..... p 3787 N93-31337 #
BR-312834 ..... p 3724 N93-31336 #

BR313437 ..... p 3716 N93-31610 #
BR313438 ..... p 3746 N93-31611 #
BR314271 ..... p 3722 N93-32422 #

CAM-9106.1 ..... p 3699 N93-31870 #

CAP-600 ..... p 3674 N93-31730
CAP-601 ..... p 3776 N93-31729

CBPF-NF-035/91 ..... p 3813 N93-31181 #

CDDF-90-07 ..... p 3730 N93-32366 * #

CL-91-01 ..... p 3788 N93-31517 #
CL-91-02 ..... p 3798 N93-31469 #
CL-91-03 ..... p 3787 N93-31478 #

CMOTT-93-9 ..... p 3809 N93-32200 * #

CMS-TR-93-12 ..... p 3808 N93-31999 #

CMU-CS-93-113 ..... p 3842 N93-32049 #
CMU-CS-93-123 ..... p 3841 N93-32048 #
CMU-CS-93-125 ..... p 3791 N93-32044 #
CMU-CS-93-146 ..... p 3777 N93-32064 #
CMU-CS-93-149 ..... p 3791 N93-32066

CMU/SEI-CM-27-1.0 ..... p 3790 N93-31793

CMU/SEI-93-TR-01 ..... p 3791 N93-32000 #

CNES-NT-129 ..... p 3719 N93-31475 #

CONF-9012154 ..... p 3823 N93-31165 #
CONF-9105279 ..... p 3783 N93-32406 #
CONF-9108228 ..... p 3820 N93-31813 #
CONF-9110426 ..... p 3773 N93-31225 #
CONF-9111280 ..... p 3708 N93-31179 #
CONF-9201117 ..... p 3818 N93-31167 #
CONF-9202134 ..... p 3821 N93-31834 #
CONF-9206173-11 ..... p 3727 N93-32303 #
CONF-9206287 ..... p 3708 N93-31089 #
CONF-920689-6 ..... p 3706 N93-32296 #
CONF-920690-1 ..... p 3830 N93-32183 #
CONF-920792-50 ..... p 3824 N93-31987 #
CONF-9209166-1 ..... p 3698 N93-32184 #
CONF-9209331-2 ..... p 3766 N93-32297 #
CONF-921040-1 ..... p 3766 N93-32295 #
CONF-921101-112 ..... p 3830 N93-32182 #
CONF-921101-61 ..... p 3712 N93-31186 #
CONF-9211128-1 ..... p 3786 N93-31183 #
CONF-921131-10 ..... p 3833 N93-32181 #
CONF-921162-9 ..... p 3711 N93-32186 #
CONF-921230-4 ..... p 3718 N93-32283 #
CONF-921265 ..... p 3765 N93-32176 #
CONF-930103-14 ..... p 3691 N93-31168 #
CONF-930103-15 ..... p 3691 N93-31185 #
CONF-930103-20 ..... p 3723 N93-31169 #
CONF-930117-7 ..... p 3795 N93-31985 #
CONF-930135-4 ..... p 3732 N93-32180 #
CONF-930192-1 ..... p 3829 N93-31988 #
CONF-930389-7 ..... p 3822 N93-32300 #
CONF-930404-12 ..... p 3796 N93-31986 #
CONF-9305110-1 ..... p 3730 N93-32306 #
CONF-930513-2 ..... p 3736 N93-32179 #
CONF-9305140-1 ..... p 3727 N93-32175 #
CONF-9305168-2 ..... p 3842 N93-32298 #
CONF-930745-1 ..... p 3792 N93-32299 #

CONTRIB-1431 ..... p 3768 N93-31874 #

CRDKNSWC-SSM-64-92/22 ..... p 3699 N93-31065 #

CRHC-93-15 ..... p 3785 N93-32233 * #
CRHC-93-16 ..... p 3796 N93-32355 * #

CS-9206 ..... p 3789 N93-31629 #

CSDL-T-1183 ..... p 3690 N93-32228 * #

CSE-93-08 ..... p 3784 N93-31849 * #

CT-91-12 ..... p 3787 N93-31479 #
CT-92-01 ..... p 3788 N93-31528 #
CT-92-02 ..... p 3788 N93-31529 #
CT-92-03 ..... p 3806 N93-31530 #

CTR-3-4-90/2-983-4/1 ..... p 3712 N93-31326 #
CTR-3-4-90/2-983-4/2 ..... p 3713 N93-31327 #

CWI-NM-R921M ..... p 3756 N93-32393 #
CWI-NM-R9218 ..... p 3810 N93-32394 #
CWI-NM-R9219 ..... p 3796 N93-32395 #
CWI-NM-R9220 ..... p 3797 N93-32396 #

DCW-R-35-03 ..... p 3727 N93-32329 * #

DESY-92-159 ..... p 3728 N93-31117 #

DE92-017845 ..... p 3698 N93-32184 #
DE92-526848 ..... p 3792 N93-32185 #
DE92-640219 ..... p 3711 N93-32187 #
DE92-642079 ..... p 3830 N93-32405 #
DE92-642335 ..... p 3783 N93-32406 #
DE92-642554 ..... p 3801 N93-31067 #
DE92-642558 ..... p 3802 N93-31072 #
DE92-642559 ..... p 3802 N93-31079 #
DE92-642586 ..... p 3851 N93-31073 #
DE92-642587 ..... p 3757 N93-31081 #
DE92-642588 ..... p 3802 N93-31074 #
DE92-642593 ..... p 3830 N93-31075 #
DE92-642676 ..... p 3820 N93-31805 #
DE92-642677 ..... p 3827 N93-31159 #
DE92-644668 ..... p 3802 N93-31160 #
DE92-644669 ..... p 3803 N93-31285 #
DE92-645691 ..... p 3815 N93-31806 #
DE93-000248 ..... p 3721 N93-32174 #
DE93-000683 ..... p 3711 N93-32186 #
DE93-002249 ..... p 3691 N93-31168 #
DE93-003239 ..... p 3723 N93-31169 #
DE93-003243 ..... p 3786 N93-31183 #
DE93-003797 ..... p 3691 N93-31185 #
DE93-004766 ..... p 3704 N93-31184 #
DE93-005451 ..... p 3712 N93-31186 #
DE93-005736 ..... p 3744 N93-31187 #
DE93-008704 ..... p 3727 N93-32175 #
DE93-009059 ..... p 3795 N93-31985 #
DE93-009061 ..... p 3796 N93-31986 #
DE93-009161 ..... p 3765 N93-32176 #
DE93-009328 ..... p 3824 N93-31987 #
DE93-009514 ..... p 3829 N93-31988 #
DE93-009932 ..... p 3750 N93-32281 #
DE93-010007 ..... p 3750 N93-32177 #
DE93-010175 ..... p 3750 N93-32282 #
DE93-010286 ..... p 3686 N93-32178 #
DE93-010337 ..... p 3736 N93-32179 #
DE93-010403 ..... p 3732 N93-32288 #
DE93-010563 ..... p 3822 N93-32159 #
DE93-010689 ..... p 3732 N93-32180 #
DE93-010798 ..... p 3718 N93-32283 #
DE93-010926 ..... p 3735 N93-31790 #
DE93-010955 ..... p 3833 N93-32181 #
DE93-011035 ..... p 3830 N93-32182 #
DE93-011674 ..... p 3830 N93-32183 #
DE93-012326 ..... p 3851 N93-32160 #
DE93-012429 ..... p 3710 N93-32161 #
DE93-012533 ..... p 3822 N93-32294 #
DE93-012550 ..... p 3766 N93-32295 #
DE93-012570 ..... p 3706 N93-32296 #
DE93-012583 ..... p 3766 N93-32297 #
DE93-012622 ..... p 3842 N93-32298 #
DE93-012708 ..... p 3792 N93-32299 #
DE93-012747 ..... p 3822 N93-32300 #
DE93-012837 ..... p 3816 N93-32301 #
DE93-012865 ..... p 3707 N93-32302 #
DE93-012933 ..... p 3822 N93-32162 #
DE93-012958 ..... p 3727 N93-32303 #
DE93-013082 ..... p 3715 N93-32163 #
DE93-013172 ..... p 3765 N93-32164 #
DE93-013233 ..... p 3765 N93-32165 #
DE93-013498 ..... p 3718 N93-32425 #
DE93-013500 ..... p 3732 N93-32304 #
DE93-013601 ..... p 3800 N93-32305 #
DE93-013761 ..... p 3730 N93-32306 #
DE93-013978 ..... p 3711 N93-32307 #
DE93-013982 ..... p 3769 N93-32289 #
DE93-014437 ..... p 3833 N93-32290 #
DE93-014707 ..... p 3815 N93-32291 #
DE93-014770 ..... p 3711 N93-32292 #
DE93-014771 ..... p 3711 N93-32293 #
DE93-603677 ..... p 3771 N93-31161 #
DE93-604081 ..... p 3802 N93-31162 #
DE93-604134 ..... p 3813 N93-31102 #
DE93-604232 ..... p 3808 N93-31820 #
DE93-604519 ..... p 3820 N93-31821 #
DE93-604639 ..... p 3820 N93-31822 #
DE93-604671 ..... p 3812 N93-31083 #
DE93-604672 ..... p 3825 N93-31084 #
DE93-604742 ..... p 3827 N93-31086 #
DE93-604906 ..... p 3818 N93-31239 #
DE93-605265 ..... p 3706 N93-31827 #
DE93-605320 ..... p 3710 N93-31828 #
DE93-605636 ..... p 3750 N93-31092 #
DE93-605749 ..... p 3740 N93-31823 #
DE93-605897 ..... p 3814 N93-31088 #
DE93-606193 ..... p 3703 N93-31824 #
DE93-606394 ..... p 3720 N93-31825 #
DE93-606725 ..... p 3704 N93-31093 #
DE93-606751 ..... p 3688 N93-31076 #
DE93-606752 ..... p 3706 N93-31660 #
DE93-606833 ..... p 3708 N93-31089 #
DE93-607553 ..... p 3732 N93-31826 #
DE93-607555 ..... p 3823 N93-31090 #
DE93-607634 ..... p 3729 N93-31835 #
DE93-608159 ..... p 3832 N93-31807 #
DE93-608160 ..... p 3807 N93-31808 #
DE93-608161 ..... p 3819 N93-31286 #
DE93-608162 ..... p 3831 N93-31287 #
DE93-608163 ..... p 3803 N93-31288 #
DE93-608164 ..... p 3803 N93-31289 #
DE93-608166 ..... p 3813 N93-31301 #
DE93-608185 ..... p 3831 N93-31302 #
DE93-608186 ..... p 3803 N93-31303 #
DE93-608191 ..... p 3757 N93-31304 #
DE93-608192 ..... p 3757 N93-31305 #
DE93-608194 ..... p 3804 N93-31306 #
DE93-608195 ..... p 3810 N93-31307 #
DE93-608199 ..... p 3813 N93-31460 #
DE93-608200 ..... p 3831 N93-31509 #
DE93-608201 ..... p 3807 N93-31661 #
DE93-608203 ..... p 3818 N93-31240 #
DE93-608244 ..... p 3808 N93-31819 #
DE93-608263 ..... p 3832 N93-31809 #
DE93-608264 ..... p 3819 N93-31662 #
DE93-608326 ..... p 3818 N93-31241 #
DE93-608327 ..... p 3818 N93-31242 #
DE93-608329 ..... p 3819 N93-31243 #
DE93-608386 ..... p 3813 N93-31290 #
DE93-608399 ..... p 3832 N93-31663 #
DE93-608484 ..... p 3817 N93-31059 #
DE93-608514 ..... p 3828 N93-31664 #
DE93-608520 ..... p 3819 N93-31665 #
DE93-608522 ..... p 3819 N93-31666 #

DE93-608560 ..... p 3826 N93-31673 #
DE93-608570 ..... p 3825 N93-31667 #
DE93-608571 ..... p 3826 N93-31668 #
DE93-608677 ..... p 3731 N93-31669 #
DE93-608691 ..... p 3827 N93-31098 #
DE93-608692 ..... p 3817 N93-31099 #
DE93-608693 ..... p 3827 N93-31100 #
DE93-608696 ..... p 3827 N93-31077
DE93-608697 ..... p 3827 N93-31163 #
DE93-608737 ..... p 3825 N93-31164 #
DE93-608744 ..... p 3820 N93-31813 #
DE93-608934 ..... p 3708 N93-31174 #
DE93-608938 ..... p 3827 N93-31175 #
DE93-609038 ..... p 3828 N93-31176 #
DE93-609039 ..... p 3708 N93-31177 #
DE93-609052 ..... p 3708 N93-31178 #
DE93-609128 ..... p 3803 N93-31224 #
DE93-609131 ..... p 3773 N93-31225 #
DE93-609337 ..... p 3708 N93-31179 #
DE93-609388 ..... p 3831 N93-31226 #
DE93-609404 ..... p 3731 N93-31227 #
DE93-609405 ..... p 3818 N93-31228 #
DE93-609444 ..... p 3819 N93-31244 #
DE93-609489 ..... p 3723 N93-31245 #
DE93-609517 ..... p 3823 N93-31246 #
DE93-609531 ..... p 3729 N93-31247 #
DE93-609814 ..... p 3786 N93-31248 #
DE93-609832 ..... p 3802 N93-31180 #
DE93-609841 ..... p 3829 N93-31814 #
DE93-609842 ..... p 3815 N93-32410 #
DE93-609843 ..... p 3833 N93-32411 #
DE93-609845 ..... p 3813 N93-31905 #
DE93-609846 ..... p 3813 N93-31906 #
DE93-609847 ..... p 3821 N93-31907 #
DE93-609848 ..... p 3832 N93-31908 #
DE93-609881 ..... p 3832 N93-31909 #
DE93-609885 ..... p 3814 N93-31910 #
DE93-609887 ..... p 3814 N93-32412 #
DE93-609888 ..... p 3832 N93-31911 #
DE93-609915 ..... p 3813 N93-31181 #
DE93-609917 ..... p 3808 N93-31912 #
DE93-609920 ..... p 3821 N93-31913 #
DE93-609921 ..... p 3832 N93-31914 #
DE93-609932 ..... p 3832 N93-32025 #
DE93-609989 ..... p 3821 N93-32026 #
DE93-613987 ..... p 3830 N93-32280 #
DE93-616909 ..... p 3822 N93-32407 #
DE93-619667 ..... p 3809 N93-32284 #
DE93-619668 ..... p 3809 N93-32285 #
DE93-619669 ..... p 3809 N93-32286 #
DE93-619670 ..... p 3809 N93-32287 #
DE93-704237 ..... p 3820 N93-31810 #
DE93-704276 ..... p 3823 N93-31165 #
DE93-704290 ..... p 3821 N93-31834 #
DE93-715383 ..... p 3825 N93-31097 #
DE93-715538 ..... p 3813 N93-31166 #
DE93-715539 ..... p 3818 N93-31167 #
DE93-767966 ..... p 3672 N93-31189 #
DE93-768157 ..... p 3749 N93-32041 #
DE93-768166 ..... p 3749 N93-32042 #
DE93-768249 ..... p 3749 N93-32053 #
DE93-768268 ..... p 3749 N93-32054 #
DE93-768309 ..... p 3748 N93-31811 #
DE93-768332 ..... p 3721 N93-32055 #
DE93-768429 ..... p 3748 N93-32038 #
DE93-768440 ..... p 3749 N93-32056 #
DE93-768469 ..... p 3748 N93-31812 #
DE93-768470 ..... p 3749 N93-32057 #
DE93-768472 ..... p 3750 N93-32058 #
DE93-768474 ..... p 3754 N93-32039 #
DE93-768475 ..... p 3754 N93-32040 #

DGLR-91-27 ..... p 3699 N93-31044 #
DGLR-92-03-087 ..... p 3843 N93-31045 #

DLR-FB-90-53 ..... p 3717 N93-31861 #
DLR-FB-91-05 ..... p 3716 N93-31341 #
DLR-FB-91-21 ..... p 3716 N93-31342 #
DLR-FB-91-27 ..... p 3687 N93-31593 #
DLR-FB-92-04 ..... p 3679 N93-31197 #
DLR-FB-92-17 ..... p 3700 N93-31461 #
DLR-FB-92-18 ..... p 3719 N93-31462 #
DLR-FB-92-19 ..... p 3681 N93-31170 #
DLR-FB-92-20 ..... p 3702 N93-31319 #
DLR-FB-92-22 ..... p 3672 N93-31320 #
DLR-FB-92-25 ..... p 3671 N93-31171 #
DLR-FB-92-29 ..... p 3775 N93-31229 #

DLR-MITT-91-11 ..... p 3675 N93-31271 #

DNA-TR-92-131 ..... p 3791 N93-32034
DNA-TR-92-79 ..... p 3715 N93-31867

DOE/CE-23810/11A ..... p 3711 N93-32293 #
DOE/CE-23810/11 ..... p 3711 N93-32292 #
DOE/CE-23810/5 ..... p 3715 N93-32163 #

DOE/ER-13266/T4 ..... p 3822 N93-32162 #
DOE/ER-13530/3 ..... p 3765 N93-32164 #
DOE/ER-13560/7 ..... p 3711 N93-32307 #
DOE/ER-13740/10 ..... p 3833 N93-32290 #
DOE/ER-14064/T1 ..... p 3765 N93-32165 #
DOE/ER-40224/244 ..... p 3822 N93-32159 #
DOE/ER-40635/1 ..... p 3851 N93-32160 #
DOE/ER-45413/3 ..... p 3815 N93-32291 #
DOE/ER-60372/8 ..... p 3769 N93-32289 #

DOE/FTR-93010175 ..... p 3750 N93-32282 #
DOE/FTR-93010286 ..... p 3686 N93-32178 #
DOE/FTR-93010403 ..... p 3732 N93-32288 #
DOE/FTR-93010926 ..... p 3735 N93-31790 #

DOE/MC-25168/3291 ..... p 3721 N93-32174 #

DORA-8203 ..... p 3817 N93-32377

DOT/FAA/CT-TN92/24 ..... p 3678 N93-32336 #

DOT/FAA/CT-92/9 ..... p 3674 N93-31652 #
DOT/FAA/CT-93/4 ..... p 3671 N93-32232 #

DOT/FRA/NMI-92/04 ..... p 3736 N93-32086 #
DOT/FRA/NMI-92/10 ..... p 3735 N93-31592 #
DOT/FRA/NMI-92/11 ..... p 3736 N93-32194 #
DOT/FRA/NMI-92/16 ..... p 3735 N93-31727
DOT/FRA/NMI-92/18 ..... p 3736 N93-32193 #
DOT/FRA/NMI-92/23 ..... p 3736 N93-32192 #

DRES-SR-589 ..... p 3799 N93-32036 #

E-6068 ..... p 3692 N93-31552 * #
E-7697 ..... p 3701 N93-32219 * #
E-7831 ..... p 3683 N93-32368 * #
E-7873 ..... p 3809 N93-32200 * #
E-7891 ..... p 3673 N93-31839 * #
E-7894 ..... p 3725 N93-31647 * #
E-7898 ..... p 3682 N93-32351 * #
E-7907 ..... p 3792 N93-32322 * #
E-7925 ..... p 3681 N93-31671 * #
E-7940 ..... p 3712 N93-32367 * #
E-7941 ..... p 3698 N93-32353 * #
E-7944 ..... p 3740 N93-31193 * #
E-7946 ..... p 3750 N93-32201 * #
E-7955 ..... p 3672 N93-31648 * #
E-7961 ..... p 3717 N93-31856 * #
E-7964 ..... p 3672 N93-31672 * #
E-7970 ..... p 3723 N93-31147 * #
E-7971 ..... p 3727 N93-32199 * #
E-7973 ..... p 3812 N93-31145 * #
E-7974 ..... p 3713 N93-32330 * #
E-7975 ..... p 3735 N93-31846 * #
E-7978 ..... p 3686 N93-31670 * #
E-7979 ..... p 3712 N93-32382 * #
E-7980 ..... p 3711 N93-32352 * #
E-7983 ..... p 3808 N93-31847 * #
E-7985 ..... p 3727 N93-32370 * #
E-8000 ..... p 3698 N93-31858 * #
E-8002 ..... p 3726 N93-31860 * #

ECE-TR-93-10 ..... p 3823 N93-31799 #

ECL-93-4 ..... p 3792 N93-32239 * #

EGG-M-92261 ..... p 3698 N93-32184 #
EGG-M-92320 ..... p 3718 N93-32283 #

EPA/AA/TDG-93/05 ..... p 3736 N93-32069 #

EPA/530/R-92/017 ..... p 3752 N93-31877 #
EPA/540/AR-92/010 ..... p 3715 N93-32408 #
EPA/542/B-93/001 ..... p 3752 N93-31818 #
EPA/600/A-93/080 ..... p 3754 N93-32070 #
EPA/600/A-93/088 ..... p 3756 N93-32188 #
EPA/600/A-93/104 ..... p 3754 N93-32088 #
EPA/600/A-93/107 ..... p 3751 N93-31816 #
EPA/600/A-93/116 ..... p 3754 N93-32089 #
EPA/600/R-93/058C-VOL-2-PT-1 p 3748 N93-31070
EPA/600/R-93/058E-VOL-3-PT-1 p 3748 N93-31104
EPA/600/R-93/058E-VOL-3-PT-2 p 3748 N93-31105
EPA/600/R-93/064A ..... p 3755 N93-32168
EPA/600/R-93/064B-VOL-2 ..... p 3754 N93-32090 #
EPA/600/R-93/064C-VOL-3 ..... p 3755 N93-32091 #
EPA/600/R-93/064D-VOL-4 ..... p 3755 N93-32092 #
EPA/600/R-93/064E-VOL-5 ..... p 3755 N93-32093 #
EPA/600/R-93/075 ..... p 3756 N93-32189 #

EPRI-TR-101054-VOL-1 ..... p 3755 N93-32168
EPRI-TR-101054-VOL-2 ..... p 3754 N93-32090 #
EPRI-TR-101054-VOL-3 ..... p 3755 N93-32091 #
EPRI-TR-101054-VOL-4 ..... p 3755 N93-32092 #
EPRI-TR-101054-VOL-5 ..... p 3755 N93-32093 #

ESA-PSS-03-1101-ISSUE-1-REV-1 p 3701 N93-31740 #

ESA-PSS-03-1101-ISSUE-1-REV-2 p 3701 N93-31740 #

ESA-SP-346 ..... p 3852 N93-31674 #
ESA-SP-348 ..... p 3867 N93-31343 #
ESA-SP-354 ..... p 3844 N93-31750 #

ESA-TT-1259 ..... p 3717 N93-31861 #
ESA-TT-1261 ..... p 3716 N93-31341 #
ESA-TT-1273 ..... p 3740 N93-31428 #
ESA-TT-1275 ..... p 3724 N93-31429 #
ESA-TT-1279 ..... p 3675 N93-31271 #
ESA-TT-1280 ..... p 3716 N93-31342 #
ESA-TT-1281 ..... p 3687 N93-31593 #

ESC-TR-91-171 ..... p 3717 N93-31989 #
ESC-TR-92-132 ..... p 3850 N93-31990 #
ESC-TR-93-175 ..... p 3791 N93-32000 #

ESM-46 ..... p 3802 N93-31180 #

ESM93-2.0-CM ..... p 3701 N93-32067

ETDE/JP-MF-93768157 ..... p 3749 N93-32041 #
ETDE/JP-MF-93768166 ..... p 3749 N93-32042 #
ETDE/JP-MF-93768249 ..... p 3749 N93-32053 #
ETDE/JP-MF-93768268 ..... p 3749 N93-32054 #
ETDE/JP-MF-93768309 ..... p 3748 N93-31811 #
ETDE/JP-MF-93768332 ..... p 3721 N93-32055 #
ETDE/JP-MF-93768440 ..... p 3749 N93-32056 #

ETN-90-97325 ..... p 3744 N93-31256 #
ETN-93-93185 ..... p 3834 N93-31510 #
ETN-93-93210 ..... p 3788 N93-31511 #
ETN-93-93466 ..... p 3747 N93-32342 #
ETN-93-93467 ..... p 3747 N93-32343 #
ETN-93-93468 ..... p 3747 N93-32344 #
ETN-93-93469 ..... p 3747 N93-32345 #
ETN-93-93532 ..... p 3752 N93-31925
ETN-93-93533 ..... p 3804 N93-31338
ETN-93-93534 ..... p 3746 N93-31339
ETN-93-93535 ..... p 3731 N93-31340
ETN-93-93729 ..... p 3798 N93-31427 #
ETN-93-93730 ..... p 3724 N93-31477 #
ETN-93-93731 ..... p 3719 N93-31475 #
ETN-93-93732 ..... p 3685 N93-31318 #
ETN-93-93735 ..... p 3700 N93-31461 #
ETN-93-93736 ..... p 3719 N93-31462 #
ETN-93-93737 ..... p 3702 N93-31319 #
ETN-93-93739 ..... p 3672 N93-31320 #
ETN-93-93742 ..... p 3705 N93-31321
ETN-93-93743 ..... p 3705 N93-31322
ETN-93-93744 ..... p 3709 N93-31323
ETN-93-93745 ..... p 3705 N93-31324
ETN-93-93746 ..... p 3729 N93-31325
ETN-93-93748 ..... p 3819 N93-31335
ETN-93-93787 ..... p 3724 N93-31336 #
ETN-93-93788 ..... p 3787 N93-31337 #
ETN-93-93914 ..... p 3716 N93-31341 #
ETN-93-93915 ..... p 3740 N93-31428 #
ETN-93-93916 ..... p 3724 N93-31429 #
ETN-93-93917 ..... p 3675 N93-31271 #
ETN-93-93918 ..... p 3716 N93-31342 #
ETN-93-93919 ..... p 3687 N93-31593 #
ETN-93-93924 ..... p 3767 N93-31600
ETN-93-93925 ..... p 3767 N93-31601
ETN-93-93926 ..... p 3758 N93-31594
ETN-93-93927 ..... p 3746 N93-31595
ETN-93-93928 ..... p 3838 N93-31596
ETN-93-93930 ..... p 3674 N93-32409
ETN-93-93931 ..... p 3776 N93-31729
ETN-93-93932 ..... p 3674 N93-31730
ETN-93-93933 ..... p 3817 N93-32377
ETN-93-93944 ..... p 3852 N93-31674 #
ETN-93-93945 ..... p 3867 N93-31343 #
ETN-93-93951 ..... p 3844 N93-31750 #
ETN-93-93953 ..... p 3679 N93-31197 #
ETN-93-93955 ..... p 3681 N93-31170 #
ETN-93-93956 ..... p 3671 N93-31171 #
ETN-93-93960 ..... p 3775 N93-31229 #
ETN-93-93968 ..... p 3709 N93-31597 #
ETN-93-93976 ..... p 3807 N93-31598 #
ETN-93-93981 ..... p 3741 N93-32270 #
ETN-93-93982 ..... p 3806 N93-31544
ETN-93-93983 ..... p 3843 N93-32389
ETN-93-93984 ..... p 3810 N93-32390
ETN-93-93985 ..... p 3842 N93-32383
ETN-93-93986 ..... p 3797 N93-31254
ETN-93-93987 ..... p 3797 N93-31255
ETN-93-93988 ..... p 3786 N93-31249
ETN-93-93989 ..... p 3786 N93-31250
ETN-93-93990 ..... p 3793 N93-32391
ETN-93-93991 ..... p 3803 N93-31251
ETN-93-93992 ..... p 3787 N93-31252
ETN-93-93993 ..... p 3839 N93-31605
ETN-93-93994 ..... p 3719 N93-31253
ETN-93-93995 ..... p 3758 N93-31606

ETN-93-93996 ..... p 3792 N93-32346
ETN-93-93997 ..... p 3716 N93-31607
ETN-93-93998 ..... p 3716 N93-31608
ETN-93-93999 ..... p 3810 N93-31463
ETN-93-94000 ..... p 3811 N93-31476
ETN-93-94001 ..... p 3811 N93-31464
ETN-93-94002 ..... p 3714 N93-31465
ETN-93-94003 ..... p 3720 N93-31609
ETN-93-94004 ..... p 3787 N93-31466
ETN-93-94012 ..... p 3714 N93-31545 #
ETN-93-94013 ..... p 3838 N93-31535 #
ETN-93-94014 ..... p 3748 N93-32420 #
ETN-93-94015 ..... p 3720 N93-31862 #
ETN-93-94016 ..... p 3738 N93-31172 #
ETN-93-94017 ..... p 3821 N93-31863 #
ETN-93-94018 ..... p 3816 N93-31865 #
ETN-93-94019 ..... p 3752 N93-31853 #
ETN-93-94020 ..... p 3702 N93-32388 #
ETN-93-94021 ..... p 3824 N93-32421 #
ETN-93-94022 ..... p 3720 N93-31536 #
ETN-93-94023 ..... p 3716 N93-31610 #
ETN-93-94025 ..... p 3746 N93-31611 #
ETN-93-94027 ..... p 3722 N93-32422 #
ETN-93-94028 ..... p 3772 N93-32423 #
ETN-93-94029 ..... p 3756 N93-32424 #
ETN-93-94030 ..... p 3790 N93-31735
ETN-93-94031 ..... p 3700 N93-31736
ETN-93-94032 ..... p 3742 N93-32384
ETN-93-94033 ..... p 3705 N93-31602
ETN-93-94034 ..... p 3703 N93-31603
ETN-93-94035 ..... p 3701 N93-31740 #
ETN-93-94036 ..... p 3809 N93-32347 #
ETN-93-94037 ..... p 3815 N93-31599 #
ETN-93-94038 ..... p 3717 N93-31861 #
ETN-93-94039 ..... p 3834 N93-31518 #
ETN-93-94040 ..... p 3725 N93-31519 #
ETN-93-94041 ..... p 3709 N93-31520 #
ETN-93-94042 ..... p 3703 N93-31521 #
ETN-93-94043 ..... p 3795 N93-31522 #
ETN-93-94044 ..... p 3828 N93-31523 #
ETN-93-94045 ..... p 3714 N93-31539 #
ETN-93-94046 ..... p 3833 N93-31543 #
ETN-93-94048 ..... p 3705 N93-31540 #
ETN-93-94049 ..... p 3709 N93-31541 #
ETN-93-94050 ..... p 3746 N93-31537 #
ETN-93-94051 ..... p 3703 N93-31630 #
ETN-93-94052 ..... p 3811 N93-31618 #
ETN-93-94053 ..... p 3828 N93-31619 #
ETN-93-94054 ..... p 3828 N93-31620 #
ETN-93-94055 ..... p 3831 N93-31621 #
ETN-93-94057 ..... p 3703 N93-31622 #
ETN-93-94058 ..... p 3823 N93-31118 #
ETN-93-94059 ..... p 3675 N93-31120 #
ETN-93-94060 ..... p 3680 N93-32332 #
ETN-93-94061 ..... p 3707 N93-32385 #
ETN-93-94062 ..... p 3823 N93-31056 #
ETN-93-94063 ..... p 3684 N93-31042 #
ETN-93-94064 ..... p 3681 N93-31111 #
ETN-93-94065 ..... p 3679 N93-31840 #
ETN-93-94066 ..... p 3737 N93-32333 #
ETN-93-94067 ..... p 3701 N93-32202 #
ETN-93-94069 ..... p 3683 N93-32372 #
ETN-93-94070 ..... p 3678 N93-32337 #
ETN-93-94071 ..... p 3679 N93-32338 #
ETN-93-94072 ..... p 3802 N93-31128 #
ETN-93-94073 ..... p 3680 N93-32416 #
ETN-93-94074 ..... p 3674 N93-32357 #
ETN-93-94075 ..... p 3674 N93-32358 #
ETN-93-94076 ..... p 3679 N93-32203 #
ETN-93-94077 ..... p 3736 N93-32204 #
ETN-93-94078 ..... p 3679 N93-32205 #
ETN-93-94079 ..... p 3683 N93-32386 #
ETN-93-94080 ..... p 3714 N93-32387 #
ETN-93-94081 ..... p 3671 N93-31148 #
ETN-93-94082 ..... p 3817 N93-31149 #
ETN-93-94083 ..... p 3830 N93-31121 #
ETN-93-94084 ..... p 3831 N93-31122 #
ETN-93-94086 ..... p 3728 N93-31117 #
ETN-93-94096 ..... p 3789 N93-31629 #
ETN-93-94097 ..... p 3799 N93-31628 #
ETN-93-94098 ..... p 3807 N93-31623 #
ETN-93-94099 ..... p 3807 N93-31627 #
ETN-93-94100 ..... p 3798 N93-31512 #
ETN-93-94101 ..... p 3798 N93-31513 #
ETN-93-94103 ..... p 3805 N93-31514 #
ETN-93-94104 ..... p 3806 N93-31524 #
ETN-93-94105 ..... p 3798 N93-31525 #
ETN-93-94106 ..... p 3839 N93-31615 #
ETN-93-94107 ..... p 3795 N93-31616 #
ETN-93-94110 ..... p 3789 N93-31617 #
ETN-93-94115 ..... p 3812 N93-32392 #
ETN-93-94119 ..... p 3804 N93-31467 #
ETN-93-94120 ..... p 3798 N93-31468 #
ETN-93-94121 ..... p 3806 N93-31515 #
ETN-93-94127 ..... p 3716 N93-31516 #
ETN-93-94128 ..... p 3735 N93-31526 #
ETN-93-94130 ..... p 3725 N93-31527 #
ETN-93-94131 ..... p 3788 N93-31517 #
ETN-93-94132 ..... p 3798 N93-31469 #
ETN-93-94133 ..... p 3787 N93-31478 #
ETN-93-94134 ..... p 3787 N93-31479 #
ETN-93-94135 ..... p 3788 N93-31528 #
ETN-93-94136 ..... p 3788 N93-31529 #
ETN-93-94137 ..... p 3806 N93-31530 #
ETN-93-94138 ..... p 3806 N93-31531 #
ETN-93-94139 ..... p 3788 N93-31532 #
ETN-93-94140 ..... p 3806 N93-31533 #
ETN-93-94141 ..... p 3806 N93-31534 #
ETN-93-94142 ..... p 3804 N93-31480 #
ETN-93-94143 ..... p 3838 N93-31481 #
ETN-93-94144 ..... p 3804 N93-31482 #
ETN-93-94145 ..... p 3756 N93-32393 #
ETN-93-94146 ..... p 3810 N93-32394 #
ETN-93-94147 ..... p 3796 N93-32395 #
ETN-93-94148 ..... p 3797 N93-32396 #
ETN-93-94192 ..... p 3678 N93-31043 #
ETN-93-94193 ..... p 3699 N93-31044 #
ETN-93-94194 ..... p 3679 N93-31058 #
ETN-93-94195 ..... p 3843 N93-31045 #
ETN-93-94197 ..... p 3679 N93-31046 #
ETN-93-94199 ..... p 3739 N93-31057 #
ETN-93-94200 ..... p 3707 N93-31047 #
ETN-93-94201 ..... p 3691 N93-31048 #
ETN-93-94202 ..... p 3844 N93-31049 #
ETN-93-94203 ..... p 3851 N93-31050 #
ETN-93-94204 ..... p 3728 N93-31119 #
ETN-93-94205 ..... p 3852 N93-31091 #
ETN-93-94209 ..... p 3852 N93-31624 #
ETN-93-94210 ..... p 3758 N93-31625 #
ETN-93-94211 ..... p 3825 N93-31626 #
ETN-93-94212 ..... p 3825 N93-31542 #
ETN-93-94213 ..... p 3815 N93-31051 #
ETN-93-94214 ..... p 3671 N93-31052 #
ETN-93-94215 ..... p 3722 N93-31053 #
ETN-93-94216 ..... p 3739 N93-31123 #
ETN-93-94220 ..... p 3723 N93-31146 #
ETN-93-94223 ..... p 3672 N93-31538 #
ETN-93-94225 ..... p 3733 N93-31150 #
ETN-93-94226 ..... p 3785 N93-31151 #
ETN-93-94227 ..... p 3785 N93-31152 #
ETN-93-94228 ..... p 3734 N93-31156 #
ETN-93-94229 ..... p 3728 N93-31125 #
ETN-93-94230 ..... p 3785 N93-31126 #
ETN-93-94231 ..... p 3722 N93-31124 #
ETN-93-94232 ..... p 3785 N93-31054 #
ETN-93-94233 ..... p 3785 N93-31055 #
ETN-93-94234 ..... p 3728 N93-31127 #
ETN-93-94236 ..... p 3719 N93-31173 #
ETN-93-94238 ..... p 3786 N93-31205 #
ETN-93-94239 ..... p 3803 N93-31208 #
ETN-93-94241 ..... p 3798 N93-31483 #
ETN-93-94242 ..... p 3724 N93-31484 #
ETN-93-94243 ..... p 3804 N93-31485 #
ETN-93-94244 ..... p 3787 N93-31486 #
ETN-93-94245 ..... p 3805 N93-31487 #
ETN-93-94246 ..... p 3789 N93-31614 #
ETN-93-94247 ..... p 3807 N93-31613 #
ETN-93-94248 ..... p 3807 N93-31612 #
ETN-93-94249 ..... p 3813 N93-31502 #
ETN-93-94250 ..... p 3805 N93-31501 #
ETN-93-94251 ..... p 3805 N93-31500 #
ETN-93-94252 ..... p 3805 N93-31499 #
ETN-93-94253 ..... p 3838 N93-31498 #
ETN-93-94254 ..... p 3806 N93-31551 #
ETN-93-94255 ..... p 3806 N93-31550 #
ETN-93-94256 ..... p 3806 N93-31549 #
ETN-93-94257 ..... p 3804 N93-31470 #
ETN-93-94258 ..... p 3769 N93-31497 #
ETN-93-94259 ..... p 3724 N93-31496 #
ETN-93-94260 ..... p 3788 N93-31495 #
ETN-93-94261 ..... p 3724 N93-31494 #
ETN-93-94262 ..... p 3811 N93-31503 #
ETN-93-94263 ..... p 3795 N93-31504 #
ETN-93-94264 ..... p 3805 N93-31505 #
ETN-93-94265 ..... p 3788 N93-31506 #
ETN-93-94266 ..... p 3833 N93-31507 #
ETN-93-94267 ..... p 3734 N93-31508 #
ETN-93-94268 ..... p 3787 N93-31474 #
ETN-93-94269 ..... p 3804 N93-31471 #
ETN-93-94270 ..... p 3787 N93-31472 #
ETN-93-94271 ..... p 3794 N93-31473 #
ETN-93-94272 ..... p 3794 N93-31493 #
ETN-93-94274 ..... p 3805 N93-31492 #
ETN-93-94275 ..... p 3811 N93-31491 #
ETN-93-94276 ..... p 3740 N93-31490 #
ETN-93-94277 ..... p 3805 N93-31489 #
ETN-93-94278 ..... p 3805 N93-31488 #
ETN-93-94279 ..... p 3807 N93-31635 #
ETN-93-94280 ..... p 3725 N93-31634 #
ETN-93-94281 ..... p 3814 N93-31633 #
ETN-93-94282 ..... p 3789 N93-31632 #
ETN-93-94283 ..... p 3789 N93-31631 #
ETN-93-94284 ..... p 3793 N93-32419 #
ETN-93-94285 ..... p 3815 N93-31653 #
ETN-93-94286 ..... p 3807 N93-31654 #
ETN-93-94287 ..... p 3807 N93-31655 #
ETN-93-94288 ..... p 3790 N93-31656 #
ETN-93-94291 ..... p 3725 N93-31657 #
ETN-93-94292 ..... p 3726 N93-31658 #
ETN-93-94293 ..... p 3790 N93-31659 #
ETN-93-94294 ..... p 3795 N93-31864 #
ETN-93-94295 ..... p 3790 N93-31850 #
ETN-93-94296 ..... p 3799 N93-31851 #
ETN-93-94297 ..... p 3790 N93-31852 #
ETN-93-94298 ..... p 3788 N93-31548 #
ETN-93-94299 ..... p 3725 N93-31547 #
ETN-93-94300 ..... p 3813 N93-31546 #
ETN-93-94302 ..... p 3728 N93-32397 #
ETN-93-94304 ..... p 3810 N93-32398 #
ETN-93-94305 ..... p 3810 N93-32399 #
ETN-93-94306 ..... p 3801 N93-32400 #
ETN-93-94307 ..... p 3810 N93-32401 #
ETN-93-94459 ..... p 3685 N93-31207 #

FERMILAB-PUB-93/137-A ..... p 3861 N93-31837 * #

FFA-TN-1992-08 ..... p 3815 N93-31051 #
FFA-TN-1992-26 ..... p 3671 N93-31052 #
FFA-TN-1992-29 ..... p 3722 N93-31053 #
FFA-TN-1992-30 ..... p 3739 N93-31123 #
FFA-TN-1992-43 ..... p 3723 N93-31146 #

FFI-92/7032 ..... p 3807 N93-31598 #

FNAL/PUB-93/057-A ..... p 3822 N93-32294 #

FOA-A-40065-4.5 ..... p 3772 N93-32423 #

FOA-C-40300-4.5 ..... p 3756 N93-32424 #

FRA-24-92-0012 ..... p 3736 N93-32194 #
FRA-24-92-0014 ..... p 3735 N93-31592 #

FSGTR/INT-297 ..... p 3744 N93-31213 #

FSL-422 ..... p 3692 N93-31310 * #

GARTEUR-AD(AG07)TP069 ..... p 3671 N93-31052 #

GESAMP-48 ..... p 3750 N93-31092 #

GI-88-49B ..... p 3765 N93-32164 #

GRI-91/0212.1 ..... p 3699 N93-31870 #
GRI-92/0293 ..... p 3723 N93-31210 #
GRI-92/0354 ..... p 3708 N93-31211 #
GRI-92/0507 ..... p 3700 N93-31334 #
GRI-93/0018 ..... p 3702 N93-31209 #
GRI-93/0052 ..... p 3724 N93-31438 #
GRI-93/0077 ..... p 3702 N93-31435 #
GRI-93/0089 ..... p 3751 N93-31142 #
GRI-93/0132 ..... p 3713 N93-31434 #

GRI91/0250 ..... p 3764 N93-32087 #

GSF-BAND-8 ..... p 3752 N93-31925

H-1873 ..... p 3682 N93-32220 * #

HHG-730-1503-06 ..... p 3834 N93-31644 * #

HMMH-291550 ..... p 3736 N93-32193 #

IA-1462 ..... p 3803 N93-31224 #

IAEA-AL-056 ..... p 3820 N93-31813 #

IAF-91-356 ..... p 3737 N93-32333 #

IC-92/102 ..... p 3757 N93-31081 #
IC-92/103 ..... p 3802 N93-31074 #
IC-92/106 ..... p 3820 N93-31805 #
IC-92/113 ..... p 3802 N93-31072 #
IC-92/114 ..... p 3802 N93-31079 #
IC-92/115 ..... p 3851 N93-31073 #
IC-92/116 ..... p 3830 N93-31075 #
IC-92/117 ..... p 3808 N93-31820 #
IC-92/119 ..... p 3827 N93-31159 #
IC-92/127 ..... p 3802 N93-31160 #
IC-92/128 ..... p 3803 N93-31285 #
IC-92/136 ..... p 3815 N93-31806 #
IC-92/143 ..... p 3802 N93-31162 #
IC-92/147 ..... p 3820 N93-31822 #
IC-92/150 ..... p 3757 N93-31305 #
IC-92/151 ..... p 3820 N93-31821 #
IC-92/154 ..... p 3813 N93-31102 #
IC-92/157 ..... p 3812 N93-31083 #
IC-92/159 ..... p 3825 N93-31084 #

IC-92/160 ..... p 3827 N93-31086 #
IC-92/170 ..... p 3771 N93-31161 #
IC-92/175 ..... p 3731 N93-31669 #
IC-92/178 ..... p 3832 N93-31807 #
IC-92/188 ..... p 3807 N93-31808 #
IC-92/194 ..... p 3819 N93-31286 #
IC-92/199 ..... p 3832 N93-31663 #
IC-92/203 ..... p 3804 N93-31306 #
IC-92/205 ..... p 3704 N93-31093 #
IC-92/208 ..... p 3831 N93-31302 #
IC-92/210 ..... p 3757 N93-31304 #
IC-92/211 ..... p 3827 N93-31163 #
IC-92/212 ..... p 3810 N93-31307 #
IC-92/213 ..... p 3832 N93-31809 #
IC-92/214 ..... p 3831 N93-31287 #
IC-92/215 ..... p 3803 N93-31288 #
IC-92/216 ..... p 3819 N93-31662 #
IC-92/217 ..... p 3803 N93-31289 #
IC-92/235 ..... p 3819 N93-31665 #
IC-92/239 ..... p 3813 N93-31301 #
IC-92/240 ..... p 3803 N93-31303 #
IC-92/241 ..... p 3813 N93-31460 #
IC-92/242 ..... p 3828 N93-31664 #
IC-92/244 ..... p 3825 N93-31164 #
IC-92/247 ..... p 3819 N93-31666 #
IC-92/248 ..... p 3831 N93-31509 #
IC-92/250 ..... p 3827 N93-31098 #
IC-92/251 ..... p 3817 N93-31099 #
IC-92/252 ..... p 3827 N93-31100 #
IC-92/253 ..... p 3826 N93-31673 #
IC-92/256 ..... p 3825 N93-31667 #
IC-92/257 ..... p 3826 N93-31668 #
IC-92/277 ..... p 3830 N93-32280 #
IC-92/324 ..... p 3809 N93-32284 #
IC-92/381 ..... p 3809 N93-32285 #
IC-92/384 ..... p 3809 N93-32286 #
IC-92/385 ..... p 3809 N93-32287 #
IC-92/97 ..... p 3801 N93-31067 #

ICASE-93-17 ..... p 3792 N93-32323 * #
ICASE-93-18 ..... p 3816 N93-31868 * #
ICASE-93-19 ..... p 3808 N93-31857 * #
ICASE-93-21 ..... p 3808 N93-31843 * #
ICASE-93-22 ..... p 3803 N93-31194 * #
ICASE-93-24 ..... p 3793 N93-32359 * #

ICOMP-93-21 ..... p 3723 N93-31147 * #
ICOMP-93-22 ..... p 3727 N93-32199 * #
ICOMP-93-23 ..... p 3727 N93-32370 * #

IDA-D-1356 ..... p 3834 N93-32311 #

IDA/HQ-93-43856 ..... p 3834 N93-32311 #

IEN-27/91 ..... p 3786 N93-31248 #
IEN-36/92 ..... p 3819 N93-31244 #

IFT-P-012/92 ..... p 3807 N93-31661 #
IFT-P-020/92 ..... p 3808 N93-31912 #
IFT-P-027/92 ..... p 3832 N93-32025 #
IFT-P-028/92 ..... p 3814 N93-31910 #
IFT-P-038/91 ..... p 3830 N93-32405 #
IFT-P-045/91 ..... p 3808 N93-31819 #

ILR-MITT-270(1992) ..... p 3685 N93-31207 #

INIS-BR-2925 ..... p 3711 N93-32187 #
INIS-BR-3108 ..... p 3708 N93-31179 #

INIS-MF-13374 ..... p 3773 N93-31225 #
INIS-MF-13392 ..... p 3723 N93-31245 #

INP-MSU-91-41-245 ..... p 3822 N93-32407 #

INPE-5372 ..... p 3708 N93-31089 #

IPEN-PUB-341 ..... p 3783 N93-32406 #

IRF-SF-210 ..... p 3852 N93-31624 #

ISBN-0-08-041690-X ..... p 3748 N93-31104
ISBN-0-08-041690-X ..... p 3748 N93-31105
ISBN-0-16-041654-X ..... p 3834 N93-31433 #
ISBN-0-315-73783-2 ..... p 3842 N93-32325
ISBN-0-315-73891-X ..... p 3757 N93-31106
ISBN-0-8213-2388-1 ..... p 3751 N93-31330
ISBN-0-86-039500-6 ..... p 3674 N93-31730
ISBN-0-86-039518-9 ..... p 3776 N93-31729
ISBN-9-03-692003-5 ..... p 3838 N93-31596
ISBN-9-03-692017-5 ..... p 3767 N93-31600
ISBN-9-03-692021-3 ..... p 3767 N93-31601
ISBN-9-03-692022-1 ..... p 3758 N93-31594
ISBN-9-03-693023-X ..... p 3746 N93-31595
ISBN-9-03-700062-2 ..... p 3734 N93-31508 #
ISBN-9-03-860102-6 ..... p 3833 N93-31543 #
ISBN-9-03-860122-0 ..... p 3705 N93-31540 #
ISBN-9-03-860181-6 ..... p 3714 N93-31539 #
ISBN-9-09-005483-9 ..... p 3811 N93-31618 #
ISBN-9-09-005507-X ..... p 3746 N93-31537 #
ISBN-9-29-092226-5 ..... p 3852 N93-31674 #
ISBN-9-29-092234-6 ..... p 3844 N93-31750 #
ISBN-9-51-384110-3 ..... p 3816 N93-31865 #
ISBN-9-51-384114-6 ..... p 3752 N93-31853 #
ISBN-9-51-384115-4 ..... p 3702 N93-32388 #
ISBN-9-51-384145-6 ..... p 3714 N93-31545 #
ISBN-9-51-384153-7 ..... p 3838 N93-31535 #
ISBN-9-51-384205-3 ..... p 3748 N93-32420 #
ISBN-9-51-384211-8 ..... p 3720 N93-31862 #
ISBN-9-51-384218-5 ..... p 3821 N93-31863 #
ISBN-9-51-384230-4 ..... p 3824 N93-32421 #
ISBN-9-51-384233-9 ..... p 3720 N93-31536 #
ISBN-9-51-3845215 ..... p 3738 N93-31172 #
ISBN-92-835-0703-7 ..... p 3777 N93-32240 #
ISBN-92-835-0708-8 ..... p 3836 N93-31215 #
ISBN-92-835-0709-6 ..... p 3681 N93-31741 #
ISBN-92-9092-234-6 ..... p 3867 N93-31343 #

ISI-5752-3 ..... p 3800 N93-32197 #

ISVR-TR-208 ..... p 3742 N93-32340
ISVR-TR-213 ..... p 3726 N93-31838
ISVR-TR-215 ..... p 3817 N93-32339
ISVR-TR-218 ..... p 3774 N93-32237

ITF-91-34 ..... p 3813 N93-31290 #
ITF-91-72 ..... p 3818 N93-31240 #

ITP-91-100 ..... p 3818 N93-31241 #
ITP-91-26 ..... p 3814 N93-32412 #
ITP-91-34 ..... p 3818 N93-31242 #
ITP-91-82 ..... p 3817 N93-31059 #
ITP-91-99 ..... p 3819 N93-31243 #

IYAF-91-70 ..... p 3814 N93-31088 #

JAERI-M-92-007 ..... p 3792 N93-32185 #
JAERI-M-92-075 ..... p 3825 N93-31097 #

JINR-E-8-91-67 ..... p 3729 N93-31247 #

JINR-R-14-91-458 ..... p 3823 N93-31090 #
JINR-R-2-91-241 ..... p 3688 N93-31076 #

KAERI/AR-333/91 ..... p 3732 N93-31826 #
KAERI/AR-334/91 ..... p 3729 N93-31835 #

KAERI/RR-1043/91 ..... p 3703 N93-31824 #
KAERI/RR-1044/91 ..... p 3720 N93-31825 #
KAERI/RR-1048/91 ..... p 3740 N93-31823 #
KAERI/RR-1079/91 ..... p 3706 N93-31827 #
KAERI/RR-1096/91 ..... p 3710 N93-31828 #

KEK-PROC-91-15 ..... p 3823 N93-31165 #
KEK-PROC-92-3 ..... p 3818 N93-31167 #

KEK-91-11 ..... p 3813 N93-31166 #

KES-U-87-6 ..... p 3791 N93-32059 #

KIYAI-91-9 ..... p 3706 N93-31660 #

KNMI-PUBL-180-ED-1 ..... p 3838 N93-31596

KNMI-WR-92-01 ..... p 3767 N93-31600
KNMI-WR-92-02 ..... p 3767 N93-31601
KNMI-WR-92-03 ..... p 3758 N93-31594
KNMI-WR-92-04 ..... p 3746 N93-31595

KSL-93-18 ..... p 3801 N93-32413

KVI-951 ..... p 3817 N93-31149 #
KVI-952 ..... p 3830 N93-31121 #

K92-IOU(R) ..... p 3715 N93-31867

L-17096 ..... p 3684 N93-32380 * #
L-17128 ..... p 3796 N93-32213 * #
L-17143 ..... p 3673 N93-31733 * #
L-17144 ..... p 3812 N93-31869 * #
L-17166 ..... p 3690 N93-32381 * #
L-17187 ..... p 3822 N93-32369 * #
L-17190 ..... p 3687 N93-32379 * #

LA-UR-92-3003 ..... p 3711 N93-32186 #
LA-UR-92-3618 ..... p 3691 N93-31185 #
LA-UR-92-4025 ..... p 3712 N93-31186 #
LA-UR-93-1200 ..... p 3842 N93-32298 #
LA-UR-93-1502 ..... p 3822 N93-32300 #
LA-UR-93-1647 ..... p 3792 N93-32299 #
LA-UR-93-507 ..... p 3727 N93-32175 #

LA-12534-C ..... p 3765 N93-32176 #

LAAS-92324 ..... p 3728 N93-31127 #
LAAS-92365 ..... p 3719 N93-31173 #

LMI-PL015-R1 ..... p 3713 N93-32085

LMU-10/92 ..... p 3819 N93-31662 #

LP-92-10 ..... p 3806 N93-31531 #
LP-92-11 ..... p 3788 N93-31532 #
LP-92-12 ..... p 3806 N93-31533 #
LP-92-13 ..... p 3806 N93-31534 #

LPI/TR-92-04-PT-1 ..... p 3861 N93-31933 * #

MARMAP-ATLAS-MONO-4 ..... p 3769 N93-31591

MATHS-REPT-A-180 ..... p 3809 N93-32347 #
MATHS-REPT-A-181 ..... p 3815 N93-31599 #

MBB-FE-1-S-PUB-0504 ..... p 3678 N93-31043 #
MBB-FE-221-S-PUB-0501 ..... p 3699 N93-31044 #

MBB-LME-202-S-PUB-0485 ..... p 3679 N93-31058 #
MBB-LME-202-S-PUB-0505 ..... p 3843 N93-31045 #
MBB-LME-242-S-PUB-0451 ..... p 3679 N93-31046 #

MDC-H6821 ..... p 3688 N93-31439 * #

MEMO-COSOR-92-29 ..... p 3834 N93-31510 #

MEMO-INF-92-54 ..... p 3839 N93-31615 #
MEMO-INF-92-57 ..... p 3788 N93-31511 #
MEMO-INF-92-65 ..... p 3795 N93-31616 #
MEMO-INF-92-68 ..... p 3789 N93-31617 #

MEMO-1074 ..... p 3812 N93-32392 #
MEMO-1079 ..... p 3804 N93-31467 #
MEMO-1080 ..... p 3798 N93-31468 #
MEMO-1081 ..... p 3806 N93-31515 #
MEMO-1087 ..... p 3716 N93-31516 #
MEMO-1088 ..... p 3735 N93-31526 #
MEMO-1090 ..... p 3725 N93-31527 #
MEMO-1091 ..... p 3810 N93-32398 #
MEMO-1092 ..... p 3810 N93-32399 #
MEMO-1093 ..... p 3801 N93-32400 #
MEMO-1094 ..... p 3810 N93-32401 #

MEMT-20 ..... p 3734 N93-31508 #

MITSG-93-11 ..... p 3786 N93-31199

ML-92-06 ..... p 3804 N93-31480 #
ML-92-08 ..... p 3838 N93-31481 #
ML-92-09 ..... p 3804 N93-31482 #

MPL-U-25/93 ..... p 3771 N93-32172
MPL-U-30/93 ..... p 3769 N93-32171
MPL-U-31/93 ..... p 3771 N93-32320 #

MRL-TN-634 ..... p 3713 N93-31639 #

MTR-11263 ..... p 3718 N93-32313 #

NAL-TM-645 ..... p 3672 N93-31189 #

NAS 1.15:102839 ..... p 3683 N93-32374 * #
NAS 1.15:103939 ..... p 3740 N93-32212 * #
NAS 1.15:103989 ..... p 3673 N93-32226 * #
NAS 1.15:103998 ..... p 3678 N93-32225 * #
NAS 1.15:104025 ..... p 3678 N93-32348 * #
NAS 1.15:104263 ..... p 3682 N93-32220 * #
NAS 1.15:104566-VOL-10 ..... p 3770 N93-31859 * #
NAS 1.15:104566-VOL-4 ..... p 3771 N93-32360 * #
NAS 1.15:104737 ..... p 3783 N93-32328 * #
NAS 1.15:104773 ..... p 3727 N93-32198 * #
NAS 1.15:106148 ..... p 3683 N93-32368 * #
NAS 1.15:106173 ..... p 3809 N93-32200 * #
NAS 1.15:106186 ..... p 3673 N93-31839 * #
NAS 1.15:106189 ..... p 3725 N93-31647 * #
NAS 1.15:106192 ..... p 3682 N93-32351 * #
NAS 1.15:106216 ..... p 3681 N93-31671 * #
NAS 1.15:106223 ..... p 3712 N93-32367 * #
NAS 1.15:106225 ..... p 3740 N93-31193 * #
NAS 1.15:106228 ..... p 3750 N93-32201 * #
NAS 1.15:106235 ..... p 3672 N93-31648 * #
NAS 1.15:106241 ..... p 3717 N93-31856 * #
NAS 1.15:106245 ..... p 3672 N93-31672 * #
NAS 1.15:106248 ..... p 3723 N93-31147 * #
NAS 1.15:106249 ..... p 3727 N93-32199 * #
NAS 1.15:106251 ..... p 3812 N93-31145 * #
NAS 1.15:106252 ..... p 3713 N93-32330 * #
NAS 1.15:106253 ..... p 3735 N93-31846 * #
NAS 1.15:106254 ..... p 3686 N93-31670 * #
NAS 1.15:106256 ..... p 3712 N93-32382 * #
NAS 1.15:106257 ..... p 3711 N93-32352 * #
NAS 1.15:106258 ..... p 3808 N93-31847 * #

NAS 1.15:106260 ..... p 3727 N93-32370 * #
NAS 1.15:106272 ..... p 3698 N93-31858 * #
NAS 1.15:106273 ..... p 3726 N93-31860 * #
NAS 1.15:107730 ..... p 3673 N93-31732 * #
NAS 1.15:108266 ..... p 3834 N93-31589 * #
NAS 1.15:108410 ..... p 3824 N93-32378 * #
NAS 1.15:108411 ..... p 3700 N93-31650 * #
NAS 1.15:108412 ..... p 3706 N93-31646 * #
NAS 1.15:108416 ..... p 3730 N93-32366 * #
NAS 1.15:108764 ..... p 3843 N93-32403 * #
NAS 1.15:108990 ..... p 3680 N93-32223 * #
NAS 1.15:109003 ..... p 3796 N93-32224 * #
NAS 1.15:109011 ..... p 3715 N93-32227 * #
NAS 1.15:109225 ..... p 3834 N93-31644 * #
NAS 1.15:109226 ..... p 3712 N93-31308 * #
NAS 1.15:109227 ..... p 3825 N93-31309 * #
NAS 1.15:109228 ..... p 3692 N93-31310 * #
NAS 1.15:109229 ..... p 3685 N93-31312 * #
NAS 1.15:109236 ..... p 3701 N93-32219 * #
NAS 1.15:109410 ..... p 3838 N93-31315 * #
NAS 1.15:4440 ..... p 3684 N93-32380 * #
NAS 1.15:4442 ..... p 3690 N93-32381 * #
NAS 1.15:4453 ..... p 3687 N93-32379 * #
NAS 1.15:4523 ..... p 3747 N93-32362 * #
NAS 1.21:7011(377) ..... p 3773 N93-31924 *
NAS 1.21:7037(292) ..... p 3671 N93-32375 *
NAS 1.21:7039(43)-SECT-1 ..... p 3839 N93-31923 *
NAS 1.21:7039(43)-SECT-2 ..... p 3842 N93-32376 *
NAS 1.21:7105 ..... p 3671 N93-32404 *
NAS 1.26:188250 ..... p 3690 N93-32228 * #
NAS 1.26:191155 ..... p 3698 N93-32353 * #
NAS 1.26:191158 ..... p 3792 N93-32322 * #
NAS 1.26:191446 ..... p 3701 N93-32234 * #
NAS 1.26:191451 ..... p 3792 N93-32323 * #
NAS 1.26:191452 ..... p 3816 N93-31868 * #
NAS 1.26:191454 ..... p 3808 N93-31857 * #
NAS 1.26:191455 ..... p 3808 N93-31843 * #
NAS 1.26:191456 ..... p 3803 N93-31194 * #
NAS 1.26:191469 ..... p 3680 N93-32218 * #
NAS 1.26:191470 ..... p 3793 N93-32359 * #
NAS 1.26:191473 ..... p 3727 N93-32329 * #
NAS 1.26:192570 ..... p 3772 N93-32354 * #
NAS 1.26:192571 ..... p 3772 N93-32365 * #
NAS 1.26:192574 ..... p 3789 N93-31637 * #
NAS 1.26:192575 ..... p 3783 N93-32356 * #
NAS 1.26:192611 ..... p 3766 N93-32349 * #
NAS 1.26:192612 ..... p 3784 N93-31849 * #
NAS 1.26:192835 ..... p 3766 N93-32231 * #
NAS 1.26:192836 ..... p 3756 N93-31041 * #
NAS 1.26:193123 ..... p 3684 N93-31836 * #
NAS 1.26:193192 ..... p 3823 N93-31841 * #
NAS 1.26:193202 ..... p 3688 N93-31439 * #
NAS 1.26:193209 ..... p 3861 N93-31933 * #
NAS 1.26:193242 ..... p 3709 N93-31636 * #
NAS 1.26:193248 ..... p 3861 N93-31837 * #
NAS 1.26:193251 ..... p 3789 N93-31638 * #
NAS 1.26:193259 ..... p 3715 N93-31110 * #
NAS 1.26:193261 ..... p 3851 N93-32324 * #
NAS 1.26:193265 ..... p 3812 N93-32350 * #
NAS 1.26:193268 ..... p 3784 N93-31649 * #
NAS 1.26:193288 ..... p 3698 N93-31845 * #
NAS 1.26:193289 ..... p 3790 N93-31738 * #
NAS 1.26:193290 ..... p 3691 N93-31040 * #
NAS 1.26:193291 ..... p 3725 N93-31641 * #
NAS 1.26:193296 ..... p 3800 N93-32341 * #
NAS 1.26:193299 ..... p 3735 N93-31731 * #
NAS 1.26:193301 ..... p 3777 N93-31844 * #
NAS 1.26:193302 ..... p 3673 N93-31855 * #
NAS 1.26:193303 ..... p 3795 N93-31640 * #
NAS 1.26:193304 ..... p 3774 N93-32364 * #
NAS 1.26:193360 ..... p 3796 N93-32355 * #
NAS 1.26:193363 ..... p 3800 N93-32230 * #
NAS 1.26:193366 ..... p 3684 N93-31848 * #
NAS 1.26:193367 ..... p 3816 N93-32238 * #
NAS 1.26:193371 ..... p 3833 N93-32229 * #
NAS 1.26:193401 ..... p 3785 N93-32233 * #
NAS 1.26:193410 ..... p 3728 N93-32371 * #
NAS 1.26:193412 ..... p 3706 N93-31739 * #
NAS 1.26:193511 ..... p 3844 N93-31604 * #
NAS 1.26:193524 ..... p 3882 N93-32222 * #
NAS 1.26:193552 ..... p 3816 N93-32221 * #
NAS 1.26:193571 ..... p 3737 N93-32235 * #
NAS 1.26:193618 ..... p 3793 N93-32361 * #
NAS 1.26:193619 ..... p 3792 N93-32239 * #
NAS 1.26:193624 ..... p 3809 N93-32373 * #
NAS 1.26:193625 ..... p 3686 N93-32236 * #
NAS 1.26:193653 ..... p 3851 N93-32363 * #
NAS 1.26:4516 ..... p 3795 N93-31642 * #
NAS 1.26:4517 ..... p 3705 N93-31643 * #
NAS 1.55:10064 ..... p 3692 N93-31552 * #
NAS 1.55:3187-VOL-1 ..... p 3883 N93-32097 * #
NAS 1.55:3198-VOL-2 ..... p 3839 N93-31964 * #
NAS 1.55:3222 ..... p 3758 N93-31878 * #
NAS 1.60:3301 ..... p 3812 N93-31869 * #
NAS 1.60:3323 ..... p 3796 N93-32213 * #
NAS 1.60:3324 ..... p 3822 N93-32369 * #
NAS 1.60:3355 ..... p 3673 N93-31733 * #
NAS 1.61:1312 ..... p 3861 N93-31737 * #
NAS 1.71:GSC-13370-1 ..... p 3734 N93-31317 * #
NAS 1.71:LAR-14172-1 ..... p 3692 N93-31295 * #
NAS 1.71:LAR-14791-1 ..... p 3729 N93-31297 * #
NAS 1.71:LAR-14796-1 ..... p 3702 N93-31459 * #
NAS 1.71:LEW-14906-2 ..... p 3734 N93-31314 * #
NAS 1.71:LEW-15154-2 ..... p 3708 N93-31300 * #
NAS 1.71:LEW-15241-2 ..... p 3700 N93-31296 * #
NAS 1.71:LEW-15264-1 ..... p 3700 N93-31293 * #
NAS 1.71:LEW-15264-2 ..... p 3700 N93-31299 * #
NAS 1.71:LEW-15515-1 ..... p 3729 N93-31298 * #
NAS 1.71:LEW-15535-1 ..... p 3705 N93-31294 * #
NAS 1.71:LEW-15576-1 ..... p 3709 N93-31316 * #
NAS 1.71:MFS-28522-1 ..... p 3734 N93-31313 * #
NAS 1.77:MFS-28844-1 ..... p 3734 N93-31292 * #

NASA-CASE-GSC-13370-1 ..... p 3734 N93-31317 * #

NASA-CASE-LAR-14172-1 ..... p 3692 N93-31295 * #
NASA-CASE-LAR-14791-1 ..... p 3729 N93-31297 * #
NASA-CASE-LAR-14796-1 ..... p 3702 N93-31459 * #

NASA-CASE-LEW-14906-2 ..... p 3734 N93-31314 * #
NASA-CASE-LEW-15154-2 ..... p 3708 N93-31300 * #
NASA-CASE-LEW-15241-2 ..... p 3700 N93-31296 * #
NASA-CASE-LEW-15264-1 ..... p 3700 N93-31293 * #
NASA-CASE-LEW-15264-2 ..... p 3700 N93-31299 * #
NASA-CASE-LEW-15515-1 ..... p 3729 N93-31298 * #
NASA-CASE-LEW-15535-1 ..... p 3705 N93-31294 * #
NASA-CASE-LEW-15576-1 ..... p 3709 N93-31316 * #

NASA-CASE-MFS-28522-1 ..... p 3734 N93-31313 * #
NASA-CASE-MFS-28844-1 ..... p 3734 N93-31292 * #

NASA-CP-10064 ..... p 3692 N93-31552 * #
NASA-CP-3187-VOL-1 ..... p 3883 N93-32097 * #
NASA-CP-3198-VOL-2 ..... p 3839 N93-31964 * #
NASA-CP-3222 ..... p 3758 N93-31878 * #

NASA-CR-188250 ..... p 3690 N93-32228 * #
NASA-CR-191155 ..... p 3698 N93-32353 * #
NASA-CR-191158 ..... p 3792 N93-32322 * #
NASA-CR-191446 ..... p 3701 N93-32234 * #
NASA-CR-191451 ..... p 3792 N93-32323 * #
NASA-CR-191452 ..... p 3816 N93-31868 * #
NASA-CR-191454 ..... p 3808 N93-31857 * #
NASA-CR-191455 ..... p 3808 N93-31843 * #
NASA-CR-191456 ..... p 3803 N93-31194 * #
NASA-CR-191469 ..... p 3680 N93-32218 * #
NASA-CR-191470 ..... p 3793 N93-32359 * #
NASA-CR-191473 ..... p 3727 N93-32329 * #
NASA-CR-192570 ..... p 3772 N93-32354 * #
NASA-CR-192571 ..... p 3772 N93-32365 * #
NASA-CR-192574 ..... p 3789 N93-31637 * #
NASA-CR-192575 ..... p 3783 N93-32356 * #
NASA-CR-192611 ..... p 3766 N93-32349 * #
NASA-CR-192612 ..... p 3784 N93-31849 * #
NASA-CR-192835 ..... p 3766 N93-32231 * #
NASA-CR-192836 ..... p 3756 N93-31041 * #
NASA-CR-193123 ..... p 3684 N93-31836 * #
NASA-CR-193192 ..... p 3823 N93-31841 * #
NASA-CR-193202 ..... p 3688 N93-31439 * #
NASA-CR-193209 ..... p 3861 N93-31933 * #
NASA-CR-193242 ..... p 3709 N93-31636 * #
NASA-CR-193248 ..... p 3861 N93-31837 * #
NASA-CR-193251 ..... p 3789 N93-31638 * #
NASA-CR-193259 ..... p 3715 N93-31110 * #
NASA-CR-193261 ..... p 3851 N93-32324 * #
NASA-CR-193265 ..... p 3812 N93-32350 * #
NASA-CR-193268 ..... p 3784 N93-31649 * #
NASA-CR-193288 ..... p 3698 N93-31845 * #
NASA-CR-193289 ..... p 3790 N93-31738 * #
NASA-CR-193290 ..... p 3691 N93-31040 * #
NASA-CR-193291 ..... p 3725 N93-31641 * #
NASA-CR-193296 ..... p 3800 N93-32341 * #
NASA-CR-193299 ..... p 3735 N93-31731 * #
NASA-CR-193301 ..... p 3777 N93-31844 * #
NASA-CR-193302 ..... p 3673 N93-31855 * #
NASA-CR-193303 ..... p 3795 N93-31640 * #
NASA-CR-193304 ..... p 3774 N93-32364 * #
NASA-CR-193360 ..... p 3796 N93-32355 * #
NASA-CR-193363 ..... p 3800 N93-32230 * #
NASA-CR-193366 ..... p 3684 N93-31848 * #
NASA-CR-193367 ..... p 3816 N93-32238 * #
NASA-CR-193371 ..... p 3833 N93-32229 * #
NASA-CR-193401 ..... p 3785 N93-32233 * #
NASA-CR-193410 ..... p 3728 N93-32371 * #
NASA-CR-193412 ..... p 3706 N93-31739 * #
NASA-CR-193511 ..... p 3844 N93-31604 * #
NASA-CR-193524 ..... p 3882 N93-32222 * #
NASA-CR-193552 ..... p 3816 N93-32221 * #
NASA-CR-193571 ..... p 3737 N93-32235 * #
NASA-CR-193618 ..... p 3793 N93-32361 * #
NASA-CR-193619 ..... p 3792 N93-32239 * #
NASA-CR-193624 ..... p 3809 N93-32373 * #
NASA-CR-193625 ..... p 3686 N93-32236 * #
NASA-CR-193653 ..... p 3851 N93-32363 * #
NASA-CR-4516 ..... p 3795 N93-31642 * #
NASA-CR-4517 ..... p 3705 N93-31643 * #

NASA-RP-1312 ..... p 3861 N93-31737 * #

NASA-SP-7011(377) ..... p 3773 N93-31924 *
NASA-SP-7037(292) ..... p 3671 N93-32375 *
NASA-SP-7039(43)-SECT-1 ..... p 3839 N93-31923 *
NASA-SP-7039(43)-SECT-2 ..... p 3842 N93-32376 *
NASA-SP-7105 ..... p 3671 N93-32404 *

NASA-TM-102839 ..... p 3683 N93-32374 * #
NASA-TM-103939 ..... p 3740 N93-32212 * #
NASA-TM-103989 ..... p 3673 N93-32226 * #
NASA-TM-103998 ..... p 3678 N93-32225 * #
NASA-TM-104025 ..... p 3678 N93-32348 * #
NASA-TM-104263 ..... p 3682 N93-32220 * #
NASA-TM-104566-VOL-10 ..... p 3770 N93-31859 * #
NASA-TM-104566-VOL-4 ..... p 3771 N93-32360 * #
NASA-TM-104737 ..... p 3783 N93-32328 * #
NASA-TM-104773 ..... p 3727 N93-32198 * #
NASA-TM-106148 ..... p 3683 N93-32368 * #
NASA-TM-106173 ..... p 3809 N93-32200 * #
NASA-TM-106186 ..... p 3673 N93-31839 * #
NASA-TM-106189 ..... p 3725 N93-31647 * #
NASA-TM-106192 ..... p 3682 N93-32351 * #
NASA-TM-106216 ..... p 3681 N93-31671 * #
NASA-TM-106223 ..... p 3712 N93-32367 * #
NASA-TM-106225 ..... p 3740 N93-31193 * #
NASA-TM-106228 ..... p 3750 N93-32201 * #
NASA-TM-106235 ..... p 3672 N93-31648 * #
NASA-TM-106241 ..... p 3717 N93-31856 * #
NASA-TM-106245 ..... p 3672 N93-31672 * #
NASA-TM-106248 ..... p 3723 N93-31147 * #
NASA-TM-106249 ..... p 3727 N93-32199 * #
NASA-TM-106251 ..... p 3812 N93-31145 * #
NASA-TM-106252 ..... p 3713 N93-32330 * #
NASA-TM-106253 ..... p 3735 N93-31846 * #
NASA-TM-106254 ..... p 3686 N93-31670 * #
NASA-TM-106256 ..... p 3712 N93-32382 * #
NASA-TM-106257 ..... p 3711 N93-32352 * #
NASA-TM-106258 ..... p 3808 N93-31847 * #
NASA-TM-106260 ..... p 3727 N93-32370 * #
NASA-TM-106272 ..... p 3698 N93-31858 * #
NASA-TM-106273 ..... p 3726 N93-31860 * #
NASA-TM-107730 ..... p 3673 N93-31732 * #
NASA-TM-108266 ..... p 3834 N93-31589 * #
NASA-TM-108410 ..... p 3824 N93-32378 * #
NASA-TM-108411 ..... p 3700 N93-31650 * #
NASA-TM-108412 ..... p 3706 N93-31646 * #
NASA-TM-108416 ..... p 3730 N93-32366 * #
NASA-TM-108764 ..... p 3843 N93-32403 * #
NASA-TM-108990 ..... p 3680 N93-32223 * #
NASA-TM-109003 ..... p 3796 N93-32224 * #
NASA-TM-109011 ..... p 3715 N93-32227 * #
NASA-TM-109225 ..... p 3834 N93-31644 * #
NASA-TM-109226 ..... p 3712 N93-31308 * #
NASA-TM-109227 ..... p 3825 N93-31309 * #
NASA-TM-109228 ..... p 3692 N93-31310 * #
NASA-TM-109229 ..... p 3685 N93-31312 * #
NASA-TM-109236 ..... p 3701 N93-32219 * #
NASA-TM-109410 ..... p 3838 N93-31315 * #
NASA-TM-4440 ..... p 3684 N93-32380 * #
NASA-TM-4442 ..... p 3690 N93-32381 * #
NASA-TM-4453 ..... p 3687 N93-32379 * #
NASA-TM-4523 ..... p 3747 N93-32362 * #

NASA-TP-3301 ..... p 3812 N93-31869 * #
NASA-TP-3323 ..... p 3796 N93-32213 * #
NASA-TP-3324 ..... p 3822 N93-32369 * #
NASA-TP-3355 ..... p 3673 N93-31733 * #

NAWC-WPNS-TP-8071 ..... p 3799 N93-32082 #

NAWCADPAX-TM-992-90-SY ..... p 3777 N93-32006 #

NCAR/TN-386+STR ..... p 3764 N93-32068 #

NEDO-OS-9105 ..... p 3748 N93-32038 #

NEDO-P-9108 ..... p 3748 N93-31812 #
NEDO-P-9110 ..... p 3749 N93-32057 #
NEDO-P-9121 ..... p 3750 N93-32058 #
NEDO-P-9124 ..... p 3754 N93-32039 #
NEDO-P-9125 ..... p 3754 N93-32040 #

NIIYAF-MGU-91-41-245 ..... p 3822 N93-32407 #

NIKHEF-H/92-13 ..... p 3831 N93-31122 #
NIKHEF-H/92-15 ..... p 3728 N93-31117 #

NIRS-AR-34 ..... p 3820 N93-31810 #

NIST-SP-260-100 ..... p 3699 N93-31830

NIST/GCR-93/622 ..... p 3722 N93-31114

NIST/MONO-175 ..... p 3729 N93-31214 #

NIST/SP-500/208 ..... p 3834 N93-31431

NIST/SW/MT-93/003A ..... p 3785 N93-31112 #

NIST/TN-1401 ..... p 3703 N93-31817 #

NISTIR-5121 ..... p 3786 N93-31200 #
NISTIR-5154 ..... p 3714 N93-31109 #
NISTIR-5158 ..... p 3810 N93-31430
NISTIR-5170 ..... p 3714 N93-31196 #
NISTIR-5173 ..... p 3838 N93-31331 #
NISTIR-5176 ..... p 3797 N93-31332 #
NISTIR-5177 ..... p 3818 N93-31201 #

NLR-TP-90326-U ..... p 3823 N93-31118 #
NLR-TP-91168-U ..... p 3675 N93-31120 #
NLR-TP-91200-U ..... p 3680 N93-32332 #
NLR-TP-91203-U ..... p 3707 N93-32385 #
NLR-TP-91213-U ..... p 3823 N93-31056 #
NLR-TP-91220-U ..... p 3684 N93-31042 #
NLR-TP-91237-U ..... p 3681 N93-31111 #
NLR-TP-91260-U ..... p 3679 N93-31840 #
NLR-TP-91280-U ..... p 3737 N93-32333 #
NLR-TP-91290-U ..... p 3701 N93-32202 #
NLR-TP-91346-U ..... p 3683 N93-32372 #
NLR-TP-91349-U ..... p 3678 N93-32337 #
NLR-TP-91359-U ..... p 3679 N93-32338 #
NLR-TP-91363-U ..... p 3802 N93-31128 #
NLR-TP-91396-U ..... p 3680 N93-32416 #
NLR-TP-91404-U ..... p 3674 N93-32357 #
NLR-TP-91410-U ..... p 3674 N93-32358 #
NLR-TP-91443-U ..... p 3679 N93-32203 #
NLR-TP-91485-U ..... p 3736 N93-32204 #
NLR-TP-92009-U ..... p 3679 N93-32205 #
NLR-TP-92014-U ..... p 3683 N93-32386 #
NLR-TP-92027-U ..... p 3714 N93-32387 #
NLR-TP-92072-4 ..... p 3671 N93-31148 #

NOAA-DR-ERL-AOML-23 ..... p 3770 N93-31832

NOAA-DR-ERL-PMEL-42 ..... p 3769 N93-31333 #

NOAA-TM-ERL-ARL-201 ..... p 3752 N93-31831

NOAA-TM-ERL-FSL-5 ..... p 3767 N93-31202 #

NOAA-TM-ERL-PMEL-98 ..... p 3768 N93-31874 #

NOAA-TM-ERL-WPL-230 ..... p 3769 N93-31815 #

NOAA-TM-NWS-ER-87 ..... p 3767 N93-31329 #

NOAA-TR-NMFS-112 ..... p 3769 N93-31591

NPL-DITC-212/92 ..... p 3790 N93-31735

NPL-DMM(A)-31 ..... p 3700 N93-31736
NPL-DMM(A)-55 ..... p 3705 N93-31321
NPL-DMM(A)-68 ..... p 3705 N93-31322
NPL-DMM(A)-72 ..... p 3742 N93-32384
NPL-DMM(A)-75 ..... p 3709 N93-31323
NPL-DMM(A)-79 ..... p 3705 N93-31324
NPL-DMM(A)-80 ..... p 3705 N93-31602
NPL-DMM(A)-82 ..... p 3703 N93-31603

NPL-QU-94 ..... p 3729 N93-31325

NPL-RSA(EXT)-35 ..... p 3819 N93-31335

NPS-MA-93-016 ..... p 3800 N93-32334 #
NPS-MA-93-017 ..... p 3809 N93-32315 #
NPS-MA-93-018 ..... p 3690 N93-32335 #

NPS-MR-93-002 ..... p 3767 N93-31195 #
NPS-MR-93-003 ..... p 3767 N93-31195 #

NPS-OC-93-001 ..... p 3770 N93-32075 #

NREL/TP-411-5454 ..... p 3750 N93-32177 #

NRL/MR/5306-93-7318 ..... p 3718 N93-32414
NRL/MR/6723-93-7187 ..... p 3826 N93-32020 #
NRL/MR/6790-93-7320 ..... p 3732 N93-32019 #
NRL/MR/6791-93-7321 ..... p 3732 N93-32021 #
NRL/MR/8103-93-7307 ..... p 3686 N93-32081 #

NRL/PU/7515-93-0007 ..... p 3768 N93-32005 #
NRL/PU/7541-92-0005-PT-2-VOL-8 ..... p 3768 N93-31922 #

NSF-93-302 ..... p 3833 N93-31328 #

NSF/ISI-89028 ..... p 3703 N93-31875 #
NSF/ISI-89032 ..... p 3720 N93-31876 #
NSF/ISI-89169 ..... p 3758 N93-31872 #

NSWCDD/MP-92/547 ..... p 3721 N93-32079 #

NSWCDD/TR-92/503 ..... p 3719 N93-31085 #

NTSB/AAR-93/02 ..... p 3674 N93-32195
NTSB/AAR-93/03 ..... p 3674 N93-32196

NWRA-CR-93-R093 ..... p 3756 N93-31062 #

OCS/MMS-93/0014-VOL-1 ..... p 3770 N93-31873 #
OCS/MMS-93/0015-VOL-2 ..... p 3771 N93-32190 #
OCS/MMS-93/0016-VOL-3 ..... p 3771 N93-32308 #

OITS-495 ..... p 3822 N93-32159 #

OML-9301 ..... p 3724 N93-31438 #

ONERA-NT-1990-11 ..... p 3798 N93-31427 #
ONERA-NT-1990-12 ..... p 3724 N93-31477 #
ONERA-NT-1991-1 ..... p 3740 N93-31428 #
ONERA-NT-1991-3 ..... p 3724 N93-31429 #
ONERA-NT-1992-9 ..... p 3709 N93-31597 #

ORNL/FTR-4405 ..... p 3750 N93-32281 #

ORNL/M-1861 ..... p 3710 N93-32161 #

ORNL/TM-12094 ..... p 3707 N93-32302 #

OSWER-DIRECTIVE-9420.00-08 . p 3752 N93-31877 #

OUEL-1899/91 ..... p 3733 N93-31150 #
OUEL-1927/92 ..... p 3785 N93-31151 #
OUEL-1946/92 ..... p 3785 N93-31152 #
OUEL-1952/92 ..... p 3734 N93-31156 #
OUEL-1957/92 ..... p 3728 N93-31125 #
OUEL-1958/92 ..... p 3785 N93-31126 #
OUEL-1959/92 ..... p 3722 N93-31124 #
OUEL-1960/92 ..... p 3785 N93-31054 #
OUEL-1961/92 ..... p 3785 N93-31055 #

OZ-P-92/02 ..... p 3829 N93-31814 #
OZ-P-92/03 ..... p 3832 N93-31914 #

OZ-91/20 ..... p 3821 N93-31913 #
OZ-92/13 ..... p 3813 N93-31905 #
OZ-92/18 ..... p 3813 N93-31906 #

PB93-148542 ..... p 3736 N93-32192 #
PB93-154847 ..... p 3735 N93-31727
PB93-154854 ..... p 3735 N93-31592 #
PB93-154870 ..... p 3736 N93-32086 #
PB93-154896 ..... p 3736 N93-32193 #
PB93-154904 ..... p 3736 N93-32194 #
PB93-163178 ..... p 3785 N93-31112 #
PB93-163186 ..... p 3764 N93-32087 #
PB93-172948 ..... p 3715 N93-32408 #
PB93-174019 ..... p 3769 N93-31591
PB93-174787 ..... p 3748 N93-31070
PB93-174803 ..... p 3748 N93-31104
PB93-174811 ..... p 3748 N93-31105
PB93-174951 ..... p 3720 N93-31876 #
PB93-174977 ..... p 3703 N93-31875 #
PB93-175222 ..... p 3699 N93-31870 #
PB93-176956 ..... p 3752 N93-31877 #
PB93-176964 ..... p 3747 N93-32309 #
PB93-179612 ..... p 3768 N93-31871 #
PB93-180859 ..... p 3736 N93-32069 #
PB93-180925 ..... p 3754 N93-32070 #
PB93-181584 ..... p 3758 N93-31872 #
PB93-181881 ..... p 3810 N93-31430
PB93-182053 ..... p 3834 N93-31431
PB93-182236 ..... p 3765 N93-32191
PB93-182723 ..... p 3861 N93-32415 #
PB93-182939 ..... p 3751 N93-31432
PB93-183051 ..... p 3752 N93-31829
PB93-183796 ..... p 3699 N93-31830
PB93-184208 ..... p 3764 N93-32068 #
PB93-184539 ..... p 3752 N93-31831
PB93-184778 ..... p 3770 N93-31832
PB93-184844 ..... p 3839 N93-31833
PB93-185726 ..... p 3756 N93-32188 #
PB93-186062 ..... p 3770 N93-31873 #
PB93-186070 ..... p 3771 N93-32190 #
PB93-186088 ..... p 3771 N93-32308 #
PB93-186195 ..... p 3768 N93-31874 #
PB93-186294 ..... p 3756 N93-32189 #
PB93-186427 ..... p 3834 N93-31433 #
PB93-186492 ..... p 3712 N93-31326 #
PB93-186500 ..... p 3713 N93-31327 #
PB93-186583 ..... p 3833 N93-31328 #
PB93-186625 ..... p 3767 N93-31329 #

PB93-186698 ..... p 3755 N93-32166
PB93-186948 ..... p 3842 N93-32167
PB93-187557 ..... p 3751 N93-31330
PB93-188126 ..... p 3838 N93-31331 #
PB93-188134 ..... p 3797 N93-31332 #
PB93-188332 ..... p 3773 N93-31138 #
PB93-188415 ..... p 3769 N93-31333 #
PB93-188647 ..... p 3700 N93-31334 #
PB93-188662 ..... p 3773 N93-31140 #
PB93-188670 ..... p 3773 N93-31158 #
PB93-188787 ..... p 3713 N93-31434 #
PB93-188795 ..... p 3702 N93-31435 #
PB93-188860 ..... p 3751 N93-31142 #
PB93-188894 ..... p 3881 N93-31436 #
PB93-188902 ..... p 3881 N93-31437 #
PB93-188969 ..... p 3714 N93-31109 #
PB93-189181 ..... p 3724 N93-31438 #
PB93-189330 ..... p 3751 N93-31113
PB93-189421 ..... p 3722 N93-31114
PB93-189496 ..... p 3743 N93-31115 #
PB93-189652 ..... p 3743 N93-31116
PB93-189751 ..... p 3702 N93-31198 #
PB93-189819 ..... p 3714 N93-31196 #
PB93-189835 ..... p 3786 N93-31200 #
PB93-189868 ..... p 3818 N93-31201 #
PB93-189884 ..... p 3786 N93-31199
PB93-189967 ..... p 3702 N93-31209 #
PB93-189975 ..... p 3723 N93-31210 #
PB93-190197 ..... p 3767 N93-31202 #
PB93-190338 ..... p 3729 N93-31214 #
PB93-190460 ..... p 3708 N93-31211 #
PB93-190627 ..... p 3751 N93-31203 #
PB93-190668 ..... p 3723 N93-31204 #
PB93-190684 ..... p 3767 N93-31206 #
PB93-190817 ..... p 3751 N93-31212 #
PB93-190882 ..... p 3744 N93-31213 #
PB93-191252 ..... p 3769 N93-31815 #
PB93-191393 ..... p 3754 N93-32088 #
PB93-191427 ..... p 3751 N93-31816 #
PB93-191658 ..... p 3703 N93-31817 #
PB93-193704 ..... p 3752 N93-31818 #
PB93-194231 ..... p 3754 N93-32089 #
PB93-196095 ..... p 3755 N93-32168
PB93-196103 ..... p 3754 N93-32090 #
PB93-196111 ..... p 3755 N93-32091 #
PB93-196129 ..... p 3755 N93-32092 #
PB93-196137 ..... p 3755 N93-32093 #
PB93-910402 ..... p 3674 N93-32195
PB93-910403 ..... p 3674 N93-32196

PHC-001 ..... p 3817 N93-32317 #

PL-TR-92-3042R ..... p 3692 N93-31291 #
PL-TR-93-2025 ..... p 3764 N93-31997 #
PL-TR-93-2036 ..... p 3763 N93-31996 #
PL-TR-93-2045 ..... p 3758 N93-31803 #
PL-TR-93-2050 ..... p 3756 N93-31062 #

PNL-SA-21238 ..... p 3830 N93-32182 #

PNL-8629 ..... p 3732 N93-32304 #

PRE-1746 ..... p 3708 N93-31089 #

PRL-TH-92/16 ..... p 3832 N93-31663 #

PW/GESP-FR21998-19 ..... p 3706 N93-31795

R/D-6855-CH-02 ..... p 3713 N93-32077 #

RAE-MAT/STR-357 ..... p 3722 N93-32422 #

RAE-TM-W-1 ..... p 3724 N93-31336 #

RAE-TR-92047 ..... p 3722 N93-32422 #

RCNP-T-30 ..... p 3821 N93-31834 #

REPT-1148-93-02 ..... p 3710 N93-31801 #
REPT-1148-93-13 ..... p 3710 N93-31802 #
REPT-1533136 ..... p 3766 N93-31182
REPT-40/1992 ..... p 3722 N93-32214 #
REPT-55 ..... p 3767 N93-31206 #
REPT-699-099-352 ..... p 3701 N93-32234 * #
REPT-722792-4 ..... p 3715 N93-31110 * #
REPT-91-075 ..... p 3806 N93-31544
REPT-92-032 ..... p 3843 N93-32389
REPT-92-037 ..... p 3810 N93-32390
REPT-92-046 ..... p 3842 N93-32383
REPT-92-047 ..... p 3797 N93-31254
REPT-92-048 ..... p 3797 N93-31255
REPT-92-051 ..... p 3786 N93-31249
REPT-92-052 ..... p 3786 N93-31250
REPT-92-058 ..... p 3793 N93-32391
REPT-92-060 ..... p 3803 N93-31251
REPT-92-061/BIS ..... p 3839 N93-31605

REPT-92-061 ..... p 3787 N93-31252
REPT-92-062 ..... p 3719 N93-31253
REPT-92-065 ..... p 3758 N93-31606
REPT-92-066 ..... p 3792 N93-32346
REPT-92-067 ..... p 3716 N93-31607
REPT-92-068 ..... p 3716 N93-31608
REPT-92-069 ..... p 3810 N93-31463
REPT-92-071 ..... p 3811 N93-31476
REPT-92-078 ..... p 3811 N93-31464
REPT-92-079 ..... p 3714 N93-31465
REPT-92-080 ..... p 3720 N93-31609
REPT-92-081 ..... p 3787 N93-31466
REPT-92-102 ..... p 3725 N93-31657 #
REPT-92-103 ..... p 3726 N93-31658 #
REPT-92-104 ..... p 3790 N93-31659 #
REPT-92-105 ..... p 3795 N93-31864 #
REPT-92-106 ..... p 3790 N93-31850 #
REPT-92-49 ..... p 3798 N93-31483 #
REPT-92-50 ..... p 3724 N93-31484 #
REPT-92-51 ..... p 3804 N93-31485 #
REPT-92-52 ..... p 3787 N93-31486 #
REPT-92-53 ..... p 3805 N93-31487 #
REPT-92-54 ..... p 3789 N93-31614 #
REPT-92-55 ..... p 3807 N93-31613 #
REPT-92-56 ..... p 3807 N93-31612 #
REPT-92-57 ..... p 3813 N93-31502 #
REPT-92-58 ..... p 3805 N93-31501 #
REPT-92-59 ..... p 3805 N93-31500 #
REPT-92-60 ..... p 3805 N93-31499 #
REPT-92-61 ..... p 3838 N93-31498 #
REPT-92-62 ..... p 3806 N93-31551 #
REPT-92-63 ..... p 3806 N93-31550 #
REPT-92-64 ..... p 3806 N93-31549 #
REPT-92-65 ..... p 3804 N93-31470 #
REPT-92-66 ..... p 3769 N93-31497 #
REPT-92-67 ..... p 3724 N93-31496 #
REPT-92-68 ..... p 3788 N93-31495 #
REPT-92-69 ..... p 3724 N93-31494 #
REPT-92-70 ..... p 3811 N93-31503 #
REPT-92-71 ..... p 3795 N93-31504 #
REPT-92-72 ..... p 3805 N93-31505 #
REPT-92-73 ..... p 3788 N93-31506 #
REPT-92-74 ..... p 3833 N93-31507 #
REPT-92-75 ..... p 3787 N93-31474 #
REPT-92-76 ..... p 3804 N93-31471 #
REPT-92-77 ..... p 3787 N93-31472 #
REPT-92-78 ..... p 3794 N93-31473 #
REPT-92-79 ..... p 3794 N93-31493 #
REPT-92-82 ..... p 3805 N93-31492 #
REPT-92-83 ..... p 3811 N93-31491 #
REPT-92-84 ..... p 3740 N93-31490 #
REPT-92-85 ..... p 3805 N93-31489 #
REPT-92-86 ..... p 3805 N93-31488 #
REPT-92-90 ..... p 3807 N93-31635 #
REPT-92-91 ..... p 3725 N93-31634 #
REPT-92-92 ..... p 3814 N93-31633 #
REPT-92-93 ..... p 3789 N93-31632 #
REPT-92-94 ..... p 3789 N93-31631 #
REPT-92-95 ..... p 3793 N93-32419 #
REPT-92-96 ..... p 3815 N93-31653 #
REPT-92-97 ..... p 3807 N93-31654 #
REPT-92-98 ..... p 3807 N93-31655 #
REPT-92-99 ..... p 3790 N93-31656 #
REPT-93-01 ..... p 3799 N93-31851 #
REPT-93-02 ..... p 3790 N93-31852 #
REPT-93-03 ..... p 3788 N93-31548 #
REPT-93-04 ..... p 3725 N93-31547 #
REPT-93-05 ..... p 3813 N93-31546 #
REPT-93-07 ..... p 3728 N93-32397 #
REPT-93-9SB2-ALGAN-R1 ..... p 3710 N93-32010 #
REPT-93-9SL2-SUPER-R1 ..... p 3828 N93-31190 #
REPT-93A01457 ..... p 3758 N93-31878 * #
REPT-93B00016 ..... p 3771 N93-32360 * #
REPT-93B00074 ..... p 3747 N93-32362 * #
REPT-93B00085 ..... p 3770 N93-31859 * #
REPT-93B00096 ..... p 3861 N93-31737 * #

RL-TR-92-307 ..... p 3701 N93-32062 #
RL-TR-92-343 ..... p 3718 N93-32313 #
RL-TR-93-28 ..... p 3793 N93-32418 #

RNR-92-027 ..... p 3793 N93-32361 * #

RPI-CIRSSE-135 ..... p 3789 N93-31638 * #

RSR-C003-93 ..... p 3735 N93-31731 * #

RSRE-MEMO-4587 ..... p 3787 N93-31337 #
RSRE-MEMO-4599 ..... p 3716 N93-31610 #
RSRE-MEMO-4669 ..... p 3746 N93-31611 #

S-638 ..... p 3783 N93-32326 * #
S-706 ..... p 3883 N93-32097 * #
S-725 ..... p 3727 N93-32198 * #

SAND-92-1185 ..... p 3800 N93-32305 #
SAND-92-1880C ..... p 3786 N93-31183 #
SAND-92-2623C ..... p 3730 N93-32306 #
SAND-92-7284 ..... p 3718 N93-32425 #
SAND-92-7295C ..... p 3723 N93-31169 #
SAND-92-8003 ..... p 3816 N93-32301 #
SAND-93-0436C ..... p 3732 N93-32180 #
SAND-93-0864C ..... p 3830 N93-32183 #

SECA-FR-93-10 ..... p 3698 N93-31845 * #

SER-B-295 ..... p 3804 N93-31338

SER-C-368 ..... p 3746 N93-31339
SER-C-378 ..... p 3731 N93-31340

SGD-583-PT-1 ..... p 3881 N93-31436 #
SGD-583-PT-2 ..... p 3881 N93-31437 #

SGEB-23 ..... p 3751 N93-31113

SISSA-141/92/EP ..... p 3819 N93-31662 #

SLAC-PUB-6068 ..... p 3833 N93-32181 #

SMC-TR-93-19 ..... p 3702 N93-31064 #

SPIRE-FR-60256 ..... p 3729 N93-31191 #

SR-1 ..... p 3756 N93-31062 #
SR-3 ..... p 3758 N93-31803 #

SRA-R-93-9134-1 ..... p 3829 N93-32083

SRI-MP-92-279 ..... p 3733 N93-32402 #

SRI-PYU-7123 ..... p 3733 N93-32402 #

SS/L-TR00775 ..... p 3716 N93-31311 #

SWRI-15-2570 ..... p 3764 N93-32084

TECHNICAL-COMPLETION-272 .. p 3723 N93-31204 #

TIOS-92-25 ..... p 3788 N93-31511 #

TR-014 ..... p 3721 N93-32001 #
TR-13-ONR ..... p 3704 N93-31919 #
TR-19-ONR ..... p 3704 N93-31920 #
TR-1 ..... p 3821 N93-31995 #
TR-20 ..... p 3704 N93-31918 #
TR-41 ..... p 3821 N93-32032
TR-451 ..... p 3796 N93-32080 #
TR-50 ..... p 3721 N93-31994 #
TR-51 ..... p 3826 N93-31998 #
TR-52 ..... p 3822 N93-32312 #
TR-53 ..... p 3710 N93-31991 #
TR-92(2534)-1 ..... p 3702 N93-31064 #
TR-92-345-VOL-1 ..... p 3791 N93-32022 #
TR-92-345-VOL-2 ..... p 3791 N93-32023 #
TR-92-345-VOL-4 ..... p 3791 N93-32024 #
TR-92-345-VOL-7 ..... p 3791 N93-32007 #
TR-93-05 ..... p 3726 N93-32071 #
TR-938 ..... p 3717 N93-31989 #
TR-966 ..... p 3850 N93-31990 #

TRITA-ALP-1992-01 ..... p 3758 N93-31625 #
TRITA-ALP-92-02 ..... p 3825 N93-31626 #
TRITA-ALP-92-03 ..... p 3825 N93-31542 #

TX-93+983-4-VOL-1 ..... p 3712 N93-31326 #
TX-93+983-4-VOL-2 ..... p 3713 N93-31327 #

UAH-5-32979 ..... p 3766 N93-32349 * #

UCRL-ID-110838 ..... p 3744 N93-31187 #

UCRL-JC-107113 ..... p 3706 N93-32296 #
UCRL-JC-109822 ..... p 3766 N93-32297 #
UCRL-JC-110844 ..... p 3766 N93-32295 #
UCRL-JC-111834 ..... p 3795 N93-31985 #
UCRL-JC-111846 ..... p 3796 N93-31986 #
UCRL-JC-113251 ..... p 3829 N93-31988 #

UILU-ENG-93-2227 ..... p 3785 N93-32233 * #
UILU-ENG-93-2229 ..... p 3796 N93-32355 * #
UILU-ENG-93-2559 ..... p 3792 N93-32239 * #

UM-AERO-91-46 ..... p 3672 N93-31320 #

UM-P-91/103 ..... p 3829 N93-31814 #
UM-P-91/26 ..... p 3815 N93-32410 #
UM-P-91/39 ..... p 3833 N93-32411 #
UM-P-91/44 ..... p 3823 N93-31246 #
UM-P-91/50 ..... p 3731 N93-31227 #
UM-P-91/93 ..... p 3821 N93-31913 #
UM-P-91/97 ..... p 3818 N93-31228 #
UM-P-92/04 ..... p 3832 N93-31914 #
UM-P-92/06 ..... p 3708 N93-31177 #
UM-P-92/20 ..... p 3832 N93-31911 #
UM-P-92/23 ..... p 3708 N93-31174 #
UM-P-92/30 ..... p 3708 N93-31178 #
UM-P-92/33 ..... p 3828 N93-31176 #
UM-P-92/34 ..... p 3827 N93-31175 #
UM-P-92/41 ..... p 3821 N93-32026 #
UM-P-92/43 ..... p 3813 N93-31905 #
UM-P-92/46 ..... p 3813 N93-31906 #
UM-P-92/58 ..... p 3832 N93-31909 #

UMR-FDB-31 ..... p 3707 N93-31066 #

UNICAMP-IMECC-RP-24/92 ..... p 3821 N93-31907 #
UNICAMP-IMECC-RP-29/92 ..... p 3832 N93-31908 #

US-PATENT-APPL-SN-045343 ..... p 3702 N93-31459 * #
US-PATENT-APPL-SN-081890 ..... p 3734 N93-31292 * #
US-PATENT-APPL-SN-081910 ..... p 3709 N93-31316 * #
US-PATENT-APPL-SN-083246 ..... p 3708 N93-31300 * #
US-PATENT-APPL-SN-084058 ..... p 3700 N93-31299 * #
US-PATENT-APPL-SN-086584 ..... p 3729 N93-31298 * #
US-PATENT-APPL-SN-090838 ..... p 3692 N93-31295 * #
US-PATENT-APPL-SN-094732 ..... p 3700 N93-31296 * #
US-PATENT-APPL-SN-104951 ..... p 3734 N93-31314 * #
US-PATENT-APPL-SN-292767 ..... p 3718 N93-32210
US-PATENT-APPL-SN-516492 ..... p 3830 N93-32206
US-PATENT-APPL-SN-656924 ..... p 3734 N93-31317 * #
US-PATENT-APPL-SN-721844 ..... p 3722 N93-32207
US-PATENT-APPL-SN-828612 ..... p 3734 N93-31313 * #
US-PATENT-APPL-SN-841606 ..... p 3720 N93-31842
US-PATENT-APPL-SN-860837 ..... p 3711 N93-32209
US-PATENT-APPL-SN-872262 ..... p 3700 N93-31293 * #
US-PATENT-APPL-SN-879480 ..... p 3729 N93-31297 * #
US-PATENT-APPL-SN-892056 ..... p 3730 N93-32208
US-PATENT-APPL-SN-902201 ..... p 3830 N93-32211
US-PATENT-APPL-SN-970669 ..... p 3705 N93-31294 * #

US-PATENT-CLASS-165-96 ..... p 3830 N93-32211
US-PATENT-CLASS-250-207 ..... p 3722 N93-32207
US-PATENT-CLASS-250-551 ..... p 3720 N93-31842
US-PATENT-CLASS-324-465 ..... p 3718 N93-32210
US-PATENT-CLASS-324-663 ..... p 3830 N93-32206
US-PATENT-CLASS-367-157 ..... p 3730 N93-32208
US-PATENT-CLASS-524-204 ..... p 3711 N93-32209

US-PATENT-5,182,456 ..... p 3720 N93-31842
US-PATENT-5,188,171 ..... p 3830 N93-32211
US-PATENT-5,191,342 ..... p 3718 N93-32210
US-PATENT-5,196,690 ..... p 3722 N93-32207
US-PATENT-5,196,802 ..... p 3830 N93-32206
US-PATENT-5,199,004 ..... p 3730 N93-32208
US-PATENT-5,202,367 ..... p 3711 N93-32209

USGS/WRI-92-4035 ..... p 3765 N93-32191

UTHSCSA-OPH-93-01 ..... p 3772 N93-31094 #

UVA-528266-MS-94-113 ..... p 3706 N93-31739 * #

VKI-LS-1992-06 ..... p 3741 N93-32270 #

VKI-TN-181 ..... p 3672 N93-31538 #

VTT-JULK-762 ..... p 3816 N93-31865 #
VTT-JULK-766 ..... p 3752 N93-31853 #
VTT-JULK-767 ..... p 3702 N93-32388 #

VTT-PUBS-112 ..... p 3824 N93-32421 #
VTT-PUBS-115 ..... p 3720 N93-31536 #

VTT-TIED-1332 ..... p 3714 N93-31545 #
VTT-TIED-1340 ..... p 3838 N93-31535 #
VTT-TIED-1392 ..... p 3748 N93-32420 #
VTT-TIED-1397 ..... p 3720 N93-31862 #
VTT-TIED-1401 ..... p 3738 N93-31172 #
VTT-TIED-1404 ..... p 3821 N93-31863 #

W-9102 ..... p 3807 N93-31623 #
W-9211 ..... p 3799 N93-31628 #
W-9214 ..... p 3807 N93-31623 #
W-9215 ..... p 3807 N93-31627 #
W-9217 ..... p 3798 N93-31512 #
W-9218 ..... p 3798 N93-31513 #
W-9220 ..... p 3805 N93-31514 #
W-9221 ..... p 3806 N93-31524 #
W-9222 ..... p 3798 N93-31525 #

WATER-SUPPLY-PAPER-2390 .... p 3752 N93-31829

WHC-SA-1586 ..... p 3691 N93-31168 #

WHOI-92-35 ..... p 3770 N93-31983 #

WIS-PH-92-28 ..... p 3818 N93-31239 #

WIS-PH-92-39 ..... p 3831 N93-31226 #

WL-TR-92-4079 ..... p 3738 N93-31982 #
WL-TR-92-4089-PHASE-2 ..... p 3835 N93-31078 #
WL-TR-92-4090 ..... p 3705 N93-31192 #
WL-TR-93-3002 ..... p 3673 N93-32004 #

WORLD BANK DP-195 ..... p 3751 N93-31330

WORLDBANK/DP-188 ..... p 3755 N93-32166
WORLDBANK/DP-193 ..... p 3842 N93-32167

Y/DZ-836/R3 ..... p 3704 N93-31184 #

APPENDIX

NASA SCIENTIFIC AND TECHNICAL INFORMATION PROGRAM PRODUCTS AND SERVICES

The NASA Scientific and Technical Information (STI) Program provides for the collection and announcement of aerospace-related reports and literature obtained worldwide through agreements and exchanges. The result of the collection is the comprehensive NASA STI Database that covers aeronautics, space, and supporting disciplines.

The STI Database, documents generated or obtained by NASA, and products and services derived from or supporting the database are made available to the NASA research community and to the public. Descriptions and sources of these items are presented in the following pages.

Scientific and Technical Aerospace Reports (STAR) is an abstract journal, listing citations with abstracts for aerospace-related reports obtained from worldwide sources. *STAR* is issued on the first of each month, and announces current documents that have been entered into the NASA STI Database during the previous month. The reports are of the following types:

- NASA, NASA contractor, and NASA grantee reports;
- Reports issued by other U.S. Government agencies, domestic and foreign institutions, universities, and private firms;
- Translations in report form;
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses.

Journal, book, and conference literature, journal translations, and certain foreign dissertations having the same subject scope as *STAR* are announced in a companion journal, *International Aerospace Abstracts (IAA). IAA* is issued on the 1st and 15th of each month and is available from the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th Street, 12th Floor, New York, NY 10019.

ELIGIBILITY AND REGISTRATION FOR NASA STI PRODUCTS AND SERVICES

Organizations of the type listed below that have registered with NASA can receive products and services.

- NASA offices and installations, contractors, subcontractors, grantees, and consultants;
- Other U.S. Government agencies and their contractors;
- Libraries in the United States that have arrangements with NASA to maintain collections of NASA documents for public reference;
- Other organizations in the United States having a need for NASA documents in work related to aeronautics and space research;
- Organizations abroad that have established reciprocal documents exchange arrangements with NASA.

The central service points—central points of document acquisition and control within qualified organizations—or individuals are eligible to register for NASA STI products and services. Domestic organizations or individuals may be eligible to receive various classes of NASA publications and services and should address their requests for registration or further information to:

ATTN: Registration Services
NASA Center for AeroSpace Information
800 Elkridge Landing Road
Linthicum Heights, MD 21090-2934
301-621-0390

Organizations abroad should direct requests to:

National Aeronautics and Space Administration
Scientific and Technical Information Program (JTT)
International STI Program
Washington, DC 20546-0001
USA
703-271-5640

SUBJECT SCOPE

The subject scope of *STAR* and *IAA* includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

HOW TO USE *STAR* SUBJECT CATEGORIES

Abstracts in *STAR* are categorized by 10 major subject divisions that are divided further into 76 specific subject categories. The subject divisions and categories are listed in the Table of Contents together with a note for each that defines its scope and provides any cross-references. For example:

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information see also *03 Air Transportation and Safety* and *18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

CROSS-REFERENCES

Individual *STAR* abstracts are not ordinarily cross-referenced, except for certain conference reports or book translations that have had separate abstracts written for their component papers or chapters. Citations and abstracts of the components follow immediately after those of the parent document. When the subject content of a component differs sufficiently from the general content of the parent, a cross-reference citation also is printed at the end of the category to which it normally would have been assigned if it were independent.

DOCUMENTS ON MICROFICHE

Documents available on microfiche are designated by a pound sign (#) following the accession number.

LIMITED REPRODUCIBILITY

A note of limited reproducibility appears in the citation, if there are factors affecting the reproducibility of more than 20% of the document. These factors include faint or broken type, color photographs, black and white photographs, foldouts, dot matrix print, or some other factor that limits the reproducibility of the document. This notation also appears on the microfiche header.

COLOR COPIES

An increasing number of NASA scientific and technical reports are being produced with color graphs, charts, illustrations, and photographs. An indication that a document has color pages follows the source and pricing (SAP) information in the *STAR* citation.

Registered users of the NASA Scientific and Technical Information Program will receive ordered documents with color at no additional cost, as long as stock copies of the document are available. Otherwise, an additional fee of $2.00 per color page will be charged. The NASA Center for AeroSpace Information staff will contact registered users to determine individual user's needs.

NASA PATENTS AND PATENT APPLICATIONS

Patents and patent applications owned by NASA are announced in *STAR* under appropriate subject categories and are referenced in the *STAR* indexes. In the Report Number Index, patents are indexed by the NASA Case Number, and the U.S. Patent Class. Patent applications are indexed by the NASA Case Number and the U.S. Patent Application Serial Number.

Printed copies of patents (which are not microfiched) are available for purchase from the U.S. Patent and Trademark Office.

When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, by money order or check payable to the Commissioner of Patents and Trademarks. Prepaid purchase coupons for ordering are also available from the U.S. Patent and Trademark Office.

NASA patent application specifications are sold in both paper copy and microfiche by the NASA Center for AeroSpace Information (CASI). The N accession number should be used in ordering either paper copy or microfiche from CASI.

The patents and patent applications announced in *STAR* are owned by NASA and are available for royalty-free licensing. Requests for licensing terms and further information should be addressed to:

National Aeronautics and Space Administration
Associate General Counsel for Intellectual Property
Code GP
Washington, DC 20546-0001

SOURCES FOR DOCUMENTS

One or more sources from which a document announced in *STAR* is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below, and their addresses are listed on page A-6. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

Avail: CASI. Sold by the NASA Center for AeroSpace Information. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on page A-7.

NOTE ON ORDERING DOCUMENTS: When ordering publications from CASI, use the N accession number or other report number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy.

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in *Energy Research Abstracts*. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center - Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: ESDU. Pricing information on specific data, computer programs, and details on Engineering Sciences Data Unit (ESDU) topic categories can be obtained from ESDU International Ltd. Requesters in North America should use the Virginia address while all other requesters should use the London address, both of which are on page A-6.

Avail: Fachinformationszentrum, Karlsruhe. Gesellschaft für wissenschaftlich-technische Information mbH 7514 Eggenstein-Leopoldshafen 2, Germany.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, CA. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration (JBD-4), Public Documents Room (Room 1H23), Washington, DC 20546-0001, or public document rooms located at NASA installations, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: NTIS. Sold by the National Technical Information Service. Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) are available. For information concerning this service, consult the NTIS Subscription Section, Springfield, VA 22161.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.

Avail: US Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of $1.50 each, postage free. (See discussion of NASA patents and patent applications on page A-3.)

Avail: (US Sales Only). These foreign documents are available to users within the United States from the National Technical Information Service (NTIS). They are available to users outside the United States through the International Nuclear Information Service (INIS) representative in their country, or by applying directly to the issuing organization.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed on page A-6. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

FEDERAL DEPOSITORY LIBRARY PROGRAM

In order to provide the general public with greater access to U.S. Government publications, Congress established the Federal Depository Library Program under the Government Printing Office (GPO), with 53 regional depositories responsible for permanent retention of material, inter-library loan, and reference services. At least one copy of nearly every NASA and NASA-sponsored publication, either in printed or microfiche format, is received and retained by the 53 regional depositories. A list of the regional GPO libraries, arranged alphabetically by state, appears on page A-8. These libraries are *not* sales outlets. A local library can contact a regional depository to help locate specific reports, or direct contact may be made by an individual.

PUBLIC COLLECTION OF NASA DOCUMENTS

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England for public access. The British Library Lending Division also has available many of the non-NASA publications cited in *STAR.* European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols # and * from ESA — Information Retrieval Service European Space Agency, 8-10 rue Mario-Nikis, 75738 CEDEX 15, France.

SUBMITTING DOCUMENTS

All users of this abstract service are urged to forward reports to be considered for announcement in *STAR*. This will aid NASA in its efforts to provide the fullest possible coverage of all scientific and technical publications that might support aeronautics and space research and development. If you have prepared relevant reports (other than those you will transmit to NASA, DOD, or DOE through the usual contract- or grant-reporting channels), please send them for consideration to the NASA Center for AeroSpace Information, 800 Elkridge Landing Road, Linthicum Heights, MD 21090-2934.

Reprints of journal articles, book chapters, and conference papers are also welcome. These will be considered for announcement in *STAR's* companion journal, *IAA*.

You may specify a particular source to be included in a report announcement if you wish; otherwise the report will be placed on a public sale at the NASA Center for AeroSpace Information. Copyrighted publications will be announced but not distributed or sold.

PURCHASE OF *STAR*

STAR is publicly available on annual subscription from the NASA Center for AeroSpace Information (CASI) at $94.00/domestic, $117.00/foreign. Single copy prices: $33.00/domestic, $41.00/foreign.

An annual, cumulative *STAR Index* is also available at $54.00/domestic, $65.00/foreign.

STAR is available to registered users on annual subscription from the NASA Center for AeroSpace Information, ATTN: Registration Services, 800 Elkridge Landing Road, Linthicum Heights, MD 21090-2934.

ADDRESSES OF ORGANIZATIONS

American Institute of Aeonautics
and Astronautics
Technical Information Service
555 West 57th Street, 12th Floor
New York, NY 10019

British Library Lending Division
Boston Spa, Wetherby, Yorkshire
England

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, DC 20231

Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, TN 37830

European Space Agency-
Information Retrieval Service ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

Engineering Sciences Data Unit International
P.O. Box 1633
Manassas, VA 22110

Engineering Sciences Data Unit
International, Ltd.
251-259 Regent Street
London, W1R 7AD, England

Fachinformationszentrum Karlsruhe
Gesellschaft für wissenschaftlich-technische
Information mbH
7514 Eggenstein-Leopoldshafen 2, Germany

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Center for AeroSpace Information
800 Elkridge Landing Road
Linthicum Heights, MD 21090-2934

National Aeronautics and Space Administration
Scientific and Technical Information Program
(JTT)
Washington, DC 20546-0001

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, CA 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, MI 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey Library National Center
MS 950
12201 Sunrise Valley Drive
Reston, VA 22092

U.S. Geological Survey Library
2255 North Gemini Drive
Flagstaff, AZ 86001

U.S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025

U.S. Geological Survey Library
Box 25046
Denver Federal Center, MS914
Denver, CO 80225

CASI PRICE TABLES

(Effective August 1, 1993)

STANDARD PRICE DOCUMENTS

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
A01	$ 9.00	$ 18.00
A02	12.50	25.00
A03	17.50	35.00
A04-A05	19.50	39.00
A06-A09	27.00	54.00
A10-A13	36.50	73.00
A14-A17	44.50	89.00
A18-A21	52.00	104.00
A22-A25	61.00	122.00
A99	Call For Price	Call For Price

MICROFICHE

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
A01	$ 9.00	$ 18.00
A02	12.50	25.00
A03	17.50	35.00
A04	19.50	39.00
A06	27.00	54.00
A10	36.50	73.00

IMPORTANT NOTICE

CASI Shipping and Handling Charges
U.S.—ADD $3.00 per TOTAL ORDER
Canada and Mexico—ADD $3.50 per TOTAL ORDER
All Other Countries—ADD $7.50 per TOTAL ORDER
Does NOT apply to orders
requesting CASI RUSH HANDLING.
CASI accepts charges to American Express, Diners Club, MasterCard and VISA.

FEDERAL REGIONAL DEPOSITORY LIBRARIES

ALABAMA

AUBURN UNIV. AT MONTGOMERY LIBRARY
Documents Dept.
7300 University Dr.
Montgomery, AL 36117-3596
(205) 244-3650 Fax: (205) 244-0678

UNIV. OF ALABAMA
Amelia Gayle Gorgas Library
Govt. Documents
Box 870266
Tuscaloosa, AL 35487-0266
(205) 348-6046 Fax: (205) 348-8833

ARIZONA

DEPT. OF LIBRARY, ARCHIVES, AND PUBLIC RECORDS
Federal Documents
Third Floor State Capitol
1700 West Washington
Phoenix, AZ 85007
(602) 542-4121 Fax: (602) 542-4400, 542-4500

ARKANSAS

ARKANSAS STATE LIBRARY
State Library Services
One Capitol Mall
Little Rock, AR 72201
(501) 682-2869

CALIFORNIA

CALIFORNIA STATE LIBRARY
Govt. Publications Section
914 Capitol Mall - P.O. Box 942837
Sacramento, CA 94237-0001
(916) 322-4572 Fax: (916) 324-8120

COLORADO

UNIV. OF COLORADO - BOULDER
Norlin Library
Govt. Publications
Campus Box 184
Boulder, CO 83309-0184
(303) 492-8834 Fax: (303) 492-2185

DENVER PUBLIC LIBRARY
Govt. Publications Dept. BS/GPD
1357 Broadway
Denver, CO 80203
(303) 571-2135

CONNECTICUT

CONNECTICUT STATE LIBRARY
231 Capitol Avenue
Hartford, CT 06106
(203) 566-4971 Fax: (203) 566-3322

FLORIDA

UNIV. OF FLORIDA LIBRARIES
Documents Dept.
Library West
Gainesville, FL 32611-2048
(904) 392-0366 Fax: (904) 392-7251

GEORGIA

UNIV. OF GEORGIA LIBRARIES
Govt. Documents Dept.
Jackson Street
Athens, GA 30602
(404) 542-8949 Fax: (404) 542-6522

HAWAII

UNIV. OF HAWAII
Hamilton Library
Govt. Documents Collection
2550 The Mall
Honolulu, HI 96822
(808) 948-8230 Fax: (808) 956-5968

IDAHO

UNIV. OF IDAHO LIBRARY
Documents Section
Moscow, ID 83843
(208) 885-6344 Fax: (208) 885-6817

ILLINOIS

ILLINOIS STATE LIBRARY
Reference Dept.
300 South Second
Springfield, IL 62701-1796
(217) 782-7596 Fax: (217) 524-0041

INDIANA

INDIANA STATE LIBRARY
Serials/Documents Section
140 North Senate Avenue
Indianapolis, IN 46204
(317) 232-3678 Fax: (317) 232-3728

IOWA

UNIV. OF IOWA LIBRARIES
Govt. Publications Dept.
Washington & Madison Streets
Iowa City, IA 52242
(319) 335-5926 Fax: (319) 335-5830

KANSAS

UNIV. OF KANSAS
Govt. Documents & Map Library
6001 Malatt Hall
Lawrence, KS 66045-2800
(913) 864-4660 Fax: (913) 864-5380

KENTUCKY

UNIV. OF KENTUCKY LIBRARIES
Govt. Publications/Maps Dept.
Lexington, KY 40506-0039
(606) 257-3139 Fax: (606) 257-1563, 257-8379

LOUISIANA

LOUISIANA STATE UNIV.
Middleton Library
Govt. Documents Dept.
Baton Rouge, LA 70803
(504) 388-2570 Fax: (504) 388-6992

LOUISIANA TECHNICAL UNIV.
Prescott Memorial Library
Govt. Documents Dept.
305 Wisteria Street
Ruston, LA 71270-9985
(318) 257-4962 Fax: (318) 257-2447

MAINE

TRI-STATE DOCUMENTS DEPOS.
Raymond H. Fogler Library
Govt. Documents & Microforms Dept.
Univ. of Maine
Orono, ME 04469
(207) 581-1680

MARYLAND

UNIV. OF MARYLAND
Hornbake Library
Govt. Documents/Maps Unit
College Park, MD 20742
(301) 454-3034 Fax: (301) 454-4985

MASSACHUSETTS

BOSTON PUBLIC LIBRARY
Govt. Documents Dept.
666 Boylston Street
Boston, MA 02117
(617) 536-5400 ext. 226
Fax: (617) 267-8273, 267-8248

MICHIGAN

DETROIT PUBLIC LIBRARY
5201 Woodward Avenue
Detroit, MI 48202-4093
(313) 833-1440, 833-1409
Fax: (313) 833-5039

LIBRARY OF MICHIGAN
Govt. Documents Unit
P.O. Box 30007
Lansing, MI 48909
(517) 373-0640 Fax: (517) 373-3381

MINNESOTA

UNIV. OF MINNESOTA
Wilson Library
Govt. Publications Library
309 19th Avenue South
Minneapolis, MN 55455
(612) 624-5073 Fax: (612) 626-9353

MISSISSIPPI

UNIV. OF MISSISSIPPI
J.D. Williams Library
Federal Documents Dept.
106 Old Gym Bldg.
University, MS 38677
(601) 232-5857 Fax: (601) 232-5453

MISSOURI

UNIV. OF MISSOURI - COLUMBIA
Ellis Library
Govt. Documents
Columbia, MO 65201
(314) 882-6733 Fax: (314) 882-8044

MONTANA

UNIV. OF MONTANA
Maureen & Mike Mansfield Library
Documents Div.
Missoula, MT 59812-1195
(406)243-6700 Fax: (406) 243-2060

NEBRASKA

UNIV. OF NEBRASKA - LINCOLN
D.L. Love Memorial Library
Documents Dept.
Lincoln, NE 68588
(402) 472-2562

NEVADA

UNIV. OF NEVADA
Reno Library
Govt. Publications Dept.
Reno, NV 89557
(702) 784-6579 Fax: (702) 784-1751

NEW JERSEY

NEWARK PUBLIC LIBRARY
U.S. Documents Div.
5 Washington Street -
P.O. Box 630
Newark, NJ 07101-0630
(201) 733-7812 Fax: (201) 733-5648

NEW MEXICO

UNIV. OF NEW MEXICO
General Library
Govt. Publications Dept.
Albuquerque, NM 87131-1466
(505) 277-5441 Fax: (505) 277-6019

NEW MEXICO STATE LIBRARY
325 Don Gaspar Avenue
Santa Fe, NM 87503
(505) 827-3826 Fax: (505) 827-3820

NEW YORK

NEW YORK STATE LIBRARY
Documents/Gift & Exchange Section
Federal Depository Program
Cultural Education Center
Albany, NY 12230
(518) 474-5563 Fax: (518) 474-5786

NORTH CAROLINA

UNIV. OF NORTH CAROLINA - CHAPEL HILL
CB#3912, Davis Library
BA/SS Dept. - Documents
Chapel Hill, NC 27599
(919) 962-1151 Fax: (919) 962-0484

NORTH DAKOTA

NORTH DAKOTA STATE UNIV. LIB.
Documents Office
Fargo, ND 58105
(701) 237-8886 Fax: (701) 237-7138
In cooperation with Univ. of North Dakota, Chester Fritz Library
Grand Forks

OHIO

STATE LIBRARY OF OHIO
Documents Dept.
65 South Front Street
Columbus, OH 43266
(614) 644-7051 Fax: (614) 752-9178

OKLAHOMA

OKLAHOMA DEPT. OF LIBRARIES
U.S. Govt. Information Div.
200 NE 18th Street
Oklahoma City, OK 73105-3298
(405) 521-2502, ext. 252, 253
Fax: (405) 525-7804

OKLAHOMA STATE UNIV.
Edmon Low Library
Documents Dept.
Stillwater, OK 74078
(405) 744-6546 Fax: (405) 744-5183

OREGON

PORTLAND STATE UNIV.
Millar Library
934 SW Harrison - P.O. Box 1151
Portland, OR 97207
(503) 725-3673 Fax: (503) 725-4527

PENNSYLVANIA

STATE LIBRARY OF PENN.
Govt. Publications Section
Walnut St. & Commonwealth Ave. -
P.O. Box 1601
Harrisburg, PA 17105
(717) 787-3752

SOUTH CAROLINA

CLEMSON UNIV.
Cooper Library
Public Documents Unit
Clemson, SC 29634-3001
(803) 656-5174 Fax: (803) 656-3025
In cooperation with Univ. of South Carolina, Thomas Cooper Library, Columbia

TENNESSEE

MEMPHIS STATE UNIV. LIBRARIES
Govt. Documents
Memphis, TN 38152
(901) 678-2586 Fax: (901) 678-2511

TEXAS

TEXAS STATE LIBRARY
United States Documents
P.O. Box 12927 - 1201 Brazos
Austin, TX 78711
(512) 463-5455 Fax: (512) 463-5436

TEXAS TECH. UNIV. LIBRARY
Documents Dept.
Lubbock, TX 79409
(806) 742-2268 Fax: (806) 742-1920

UTAH

UTAH STATE UNIV.
Merrill Library & Learning Resources Center, UMC-3000
Documents Dept.
Logan, UT 84322-3000
(801) 750-2684 Fax: (801) 750-2677

VIRGINIA

UNIV. OF VIRGINIA
Aldermman Library
Govt. Documents
Charlottesville, VA 22903-2498
(804) 824-3133 Fax: (804) 924-4337

WASHINGTON

WASHINGTON STATE LIBRARY
Document Section
MS AJ-11
Olympia, WA 98504-0111
(206) 753-4027 Fax: (206) 753-3546

WEST VIRGINIA

WEST VIRGINIA UNIV. LIBRARY
Govt. Documents Section
P.O. Box 6069
Morgantown, WV 26506
(304) 293-3640

WISCONSIN

ST. HIST. SOC. OF WISCONSIN LIBRARY
Govt. Publications Section
816 State Street
Madison, WI 53706
(608) 262-2781 Fax: (608) 262-4711
In cooperation with Univ. of Wisconsin - Madison, Memorial Library

MILWAUKEE PUBLIC LIBRARY
Documents Div.
814 West Wisconsin Avenue
Milwaukee, WI 53233
(414) 278-2167 Fax: (414) 278-2137

National Aeronautics and
Space Administration
Code JTT
Washington, DC
20546-0001

Official Business
Penalty for Private Use, $300

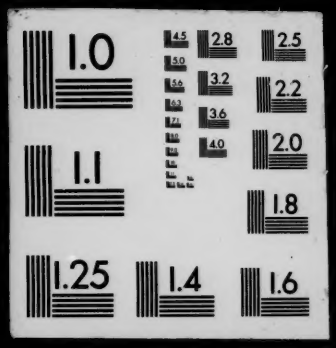
SPECIAL FOURTH-CLASS RATE
POSTAGE & FEES PAID
NASA
PERMIT No. G27

NASA

POSTMASTER: If Undeliverable (Section 158
Postal Manual) Do Not Return

Please circulate this publication to other colleagues within your organization.

NASA STI PROGRAM
SCIENTIFIC &
TECHNICAL
INFORMATION


1.0
1.1
1.25
1.4
1.6
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.8